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SIEMENS

SINAMICS G: Speed Control of a G110M / G115D / G120 with S7-1200 via PROFINET with Safety Integrated and HMI

SINAMICS G110M, G120 / SIMATIC S7-1200

<https://support.industry.siemens.com/cs/ww/en/view/70155469>

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1 Introduction

1.1 Overview

The SIMATIC S7-1200 controllers and the SINAMICS G120 drive family make it easy to integrate the drive into the automation solution. The drive is controlled by the SIMATIC S7-1200 controller. The following functions of the SINAMICS G120 and the SIMATIC S7-1200 are available for flexible and efficient implementation:

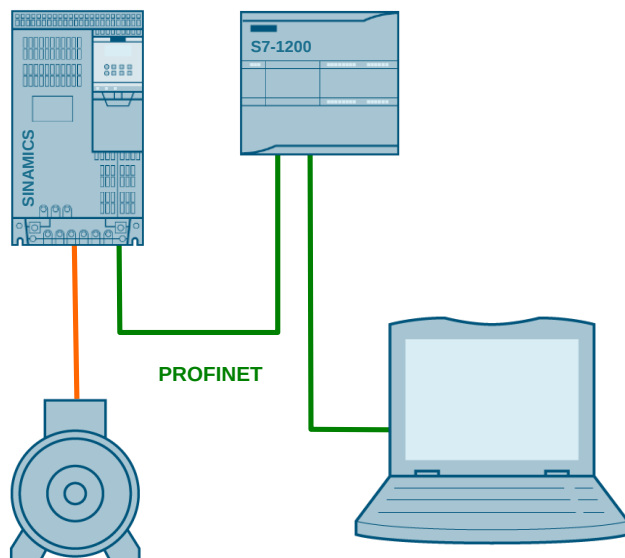
- Moving the SINAMICS G120 drive via the SIMATIC S7-1200 controller
- Reading parameters (e.g. error numbers) from the drive
- Writing parameters (e.g. ramp-up time and ramp-down time) in the drive
- Safely shutting down the drive

This application example presents and describes the functions available in the SINAMICS G120 and the SIMATIC S7-1200 for this automation task.

Overview of the automation task

The following Figure provides an overview of the automation task:

Figure 1-1: Overview



Requirements for the application example

Table 1-1: Requirements for the automation task

Request	Explanation
Access to process data	The SINAMICS G120 needs to be switched on and off via the SIMATIC S7-1200 and a speed setpoint must be specified.
Access to parameters	Read and write access is required from the SIMATIC S7-1200 to parameters in the converter (in this example: ramp-up time, ramp-down time and error numbers).
Safety function of the SINAMICS G120	The SINAMICS G120 needs to be switched off safely via the SIMATIC S7-1200.

1.2 Content of the application example

The application example shows how to set up a PROFINET connection from a SINAMICS G120 with a CU240E-2 PN to a SIMATIC S7-1215F. However, the application description can also be applied to the following drive types:

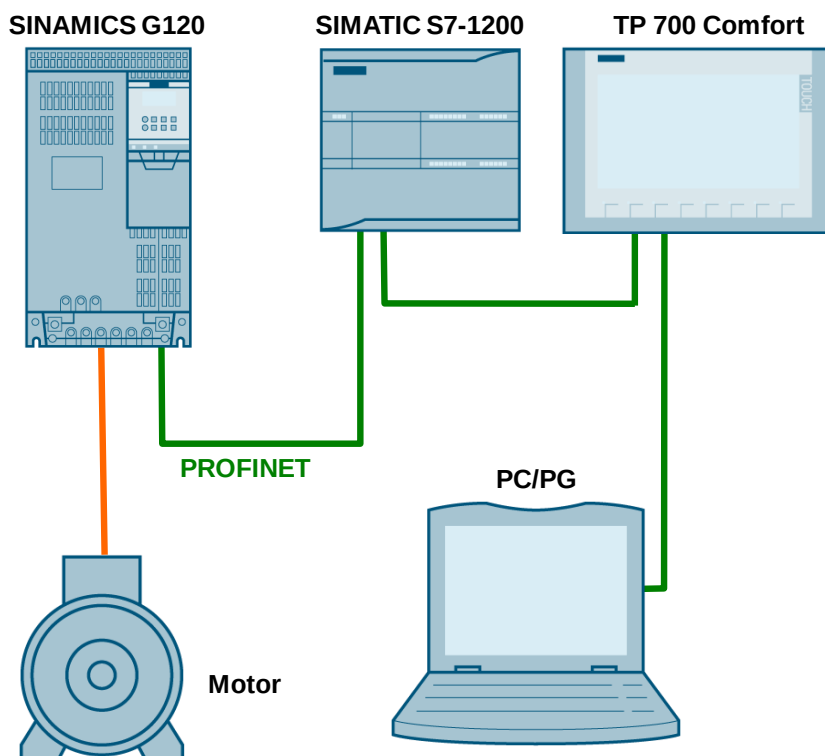
- G110M
- G115D
- G120 with CU240E-2 PN or CU250S-2 PN
- G120C PN
- G120D with CU240D-2 PN
- G120P with CU230P-2 PN

The abbreviation "G120" is used in the following to represent the above devices.

This application example uses the standard blocks "SinaSpeed" and "SinaPara" included in TIA Portal, which offer a quick and easy way to control the drive and/or access parameters.

The following Figure illustrates the most important components of the solution:

Figure 1-2: Interconnection of components



This application example describes the necessary steps for configuration and commissioning of the application.

- Configuration of the SINAMICS G120 drive and the SIMATIC S7-1200 controller
- Configuration of the communication between the drive and the controller
- Safety configuration and programming of the SINAMICS G120 drive and the SIMATIC S7-1200 controller
- Programming of the user program on the SIMATIC S7-1200 for controlling the drive with the "SinaSpeed" and "SinaPara" blocks.
- Commissioning of the application
- Using the application

1.3 Components used

This application example, and the included example project, were created with the hardware and software components listed in this chapter.

1.3.1 Hardware components used

The following hardware components were used to create the application example:

Table 1-2 Hardware components used

Component	Quantity	Item number	Note
SIMATIC S7-1200	1	6ES7-215-1AF40-0XB0	SIMATIC S7-1200F, CPU 1215 FC, compact CPU, DC/DC/DC, 2 PROFINET ports, onboard I/O: 14 DI 24VDC; 10 DO 24VDC; 0.5A; 2 AI 0-10V DC, 2 AO 0-20mA DC, Power supply: DC 20.4-28.8V DC, program/data memory 150 KB
SINAMICS G120 Control Unit CU240E-PN-F	1	6SL3244-0BB13-1FA0	SINAMICS G120 Control Unit CU240E-2 PN-F E-Type Safety integrated STO F-Type SS1, SLS, SSM, SDI PROFINET interface 6DI, 3DO, 2AI, 2AO, max. 3F-DI PTC/KTY interface USB and SD/MMC interface Protection class IP20 Ambient temperature 0 to +50°C without power module
SINAMICS G120 Power Module PM340 IP20 FSA U	1	6SL3210-1SB14-0UA0	SINAMICS S120 Inverter Power Module PM340 Input: 1AC 200-240V, 50/60Hz Output: 3AC 3.9A (0.75kW) Design: Blocksize form factor FSA internal air cooling
Motor	1	1LA7060-4AB10	SIMOTICS GP low-voltage motor, squirrel cage, IP55 4-pole* size 63M, * Thermal class 155(F) Aluminum housing 3 AC 50Hz 230VD/400VY * 0.12kW 3 AC 60Hz 460VY * 0.14kW 220-240/380-420 (50); 440-480 (60) IM B3, im B 6, im B 7, im B 8, im V 5 without canopy, im V 6
Optional: SIMATIC Panel TP700 Comfort	1	6AV2 124-0GC01-0AX0	SIMATIC HMI TP700 Comfort, Comfort Panel, touch sensitive, 7" Widescreen TFT Display, 16 million colors, PROFINET interface, MPI/PROFIBUS-DP interface, 12MB configuration memory, Windows CE 6.0, configurable with WinCC Comfort V11 or higher

You can obtain the listed components from the [Siemens Industry Mall](#), for example.

Note

The application example can also be used with other devices. In that case, the configuration in TIA Portal must be adjusted accordingly.

Note

For each project...

- devices with Safety functionality for SIMATIC S7-1200F CPUs and SINAMICS G120 devices and
- devices without Safety functionality for SIMATIC S7-1200 CPUs and SINAMICS G120 devices are available.

1.3.2 Software components used

The following software components were used to create the application example:

Table 1-3 Software components used

Component	Quantity	Item number	Note
STEP 7 Professional V19	1	6ES7822-1AE23-0YA5	Engineering software in TIA Portal
SINAMICS Startdrive V19 Advanced	1	6SL3072-4KA02-0XG5	Engineering and commissioning tool for SINAMICS drives in TIA Portal
Optional: STEP 7 Safety Advanced		6ES7833-1FA23-0YH5	Safety Engineering Software in TIA Portal
Optional: SIMATIC WinCC Advanced V19		6AV2102-0AA02-3AH5	HMI engineering software in TIA Portal

1.3.3 Application example

This application example consists of the following components:

Table 14- Components of the application example

Component	Note
70155469_SINAMICS_G120_PN_at_S7-1200_PROJ_V21.zip	Example project without Safety configuration
70155469_SINAMICS_G120_PN_at_S7-1200F_PROJ_V21.zip	Example project with Safety configuration
70155469_SINAMICS_G120_PN_at_S7-1200_DOC_V21_en.pdf	This document

2 Fundamentals

2.1 Data exchange between SIMATIC and SINAMICS

When the devices are created in the TIA Portal project, the following are automatically created and pre-assigned with default values:

- IP addresses
- PROFINET device names
- Peripheral address ranges for the data to be exchanged between drive and controller

The default values can be changed as needed to suit the respective application.

The process data being exchanged between the SIMATIC controller and the SINAMICS drive is controlled by the telegram type in the set hardware configuration (in the example: SIEMENS telegram 1).

Data exchange between the SINAMICS G120 and the SIMATIC S7-1200 takes place in three areas:

- Process data,
control word(s) and setpoint(s), or status word(s) and actual value(s)
In the example, this is done with the "SinaSpeed" instruction
- Parameter access,
read/write parameter values
In the example, this is done with the "SinaPara" instruction
- Safety communication (only with SIMATIC S7-1200F)
Control and status values for Safety Integrated functions
In the example, this is done with a block from the library "LDrvSafe"

2.1.1 Process data exchange

The process data, the content of which is defined in the hardware configuration by selecting the drive telegrams, are transmitted cyclically in each bus cycle.

For all telegrams, the SIMATIC S7-1200 sends at least the control word and the speed setpoint to the SINAMICS G120. The SINAMICS G120 sends at least the status word and the actual speed value to the controller for all telegrams.

Depending on the telegram type, additional setpoint or actual values or advanced control and status words can also be transmitted. The available telegram types can be found, for example, in the manual "SINAMICS G120 with Control Units CU240B-2 and CU240E-2" ([13](#)).

2.1.2 Parameter access

In some telegrams, in addition to the process data, there are data ranges for transmitting parameters (SIEMENS telegrams 353 and 354). These four words, like the process data, are transmitted cyclically. As a result, there is a constant communication load, although parameter transmission is rarely needed under normal circumstances.

However, in addition to cyclic data exchange, PROFINET also offers the option of using acyclic data exchange; such data are only pushed when necessary. This makes it possible to transfer the parameter range acyclically as needed without having to create a permanent communication load. Acyclic transmission requires multiple bus cycles and therefore takes longer than cyclic transmission of process data.

2.1.3 Safety communication (only with SIMATIC S7-1200F)

In addition to the telegram that transmits the process data, a Safety telegram can be created in the hardware configuration.

The Safety telegram is used to cyclically transmit control and status values for the Safety Integrated functions of the drive.

The Safety telegram is transmitted in a failsafe manner via PROFIsafe to ensure a safe shutdown of the drive.

A SIMATIC S7-1200F controller is required to control the Safety Integrated functions of the drive from the SIMATIC S7-1200 in a failsafe manner.

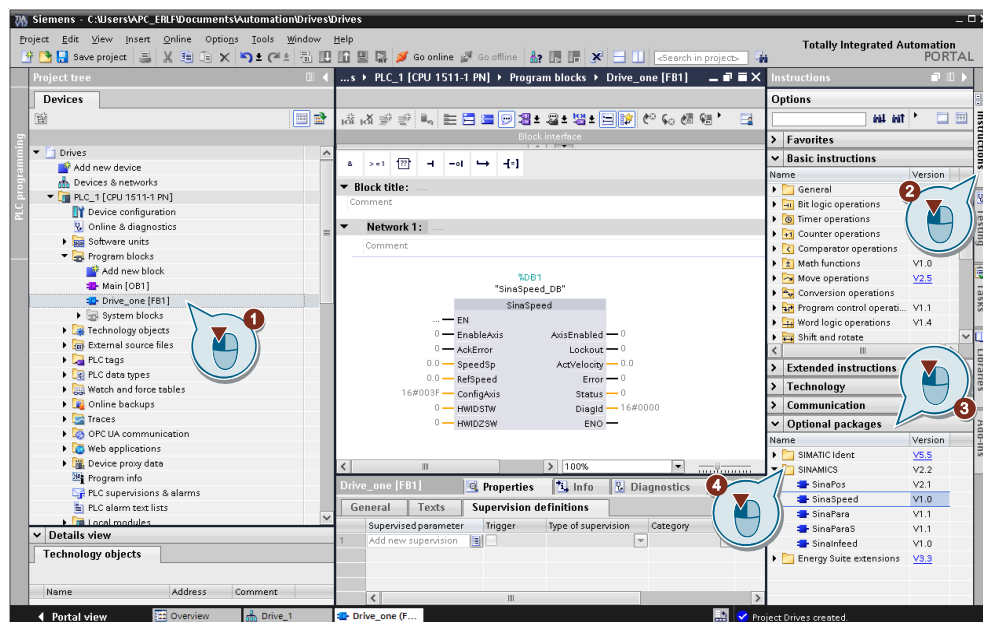
In the example, blocks from the "LDrvSafe" library are used for this purpose (see [15](#)).

2.2 Speed specification with "SinaSpeed"

Note

The "SinaSpeed" function block is included as standard in the options packages of the instructions in TIA Portal
(In the block editor (1) under Instructions (2) > Optional packages (3) > SINAMICS (4)).

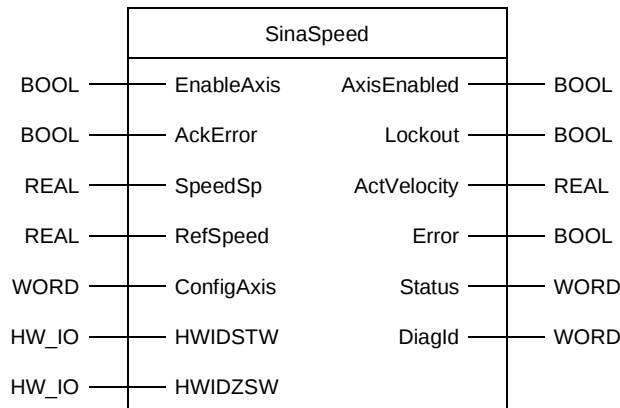
Figure 1 Instructions pre-loaded in TIA Portal



Brief description

Using the "SinaSpeed" function block, a SINAMICS drive can be moved in a speed-controlled fashion via drive telegram 1.

Figure 2-2: "SinaSpeed" block call



Block parameters

The following tables list the input and output parameters of the "SinaSpeed" block.

Table 2-1: "SinaSpeed" input parameters

Name	Type	Start value	Function
EnableAxis	BOOL	FALSE	Start/stop the drive (drive control word 1 bit 0 is assigned)
AckError	BOOL	FALSE	Acknowledge faults in the drive (assignment of drive control word 1 bit 7)
SpeedSp	REAL	0.0	Specify setpoint speed [rpm]
RefSpeed	REAL	0.0	Drive reference speed. (Entry must match drive parameter p2000)
ConfigAxis	WORD	16#003F	Assignment of the drive control word (drive parameter r2090). The initial value 16#003F sets bits 1 to 6 to TRUE: Bit 1: OFF2 Bit 2: OFF3 Bit 3: Enable operation Bit 4: Enable ramp-function generator Bit 5: Continue ramp-function generator Bit 6: Enable the speed setpoint
HWIDSTW	HW_IO	0	Hardware ID setpoint (see Parameterization section)
HWIDZSW	HW_IO	0	Hardware ID actual value (see Parameterization section)

Table 2-2: "SinaSpeed" output parameters

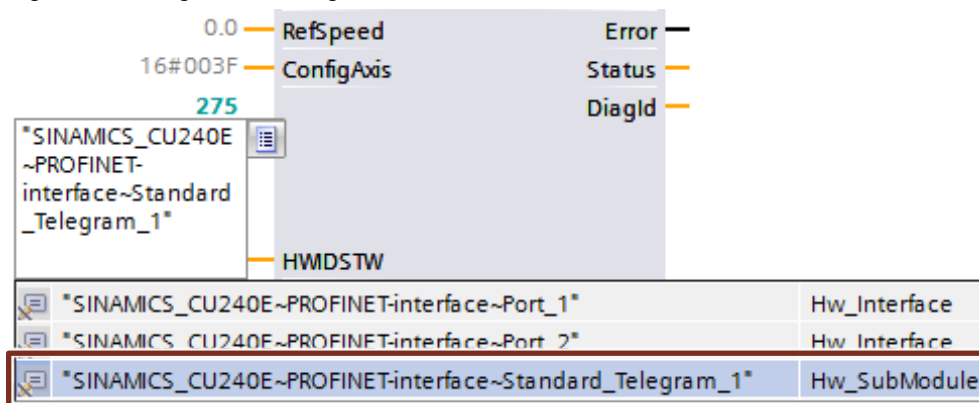
Name	Type	Start value	Function
AxisEnabled	BOOL	FALSE	Drive operation enabled
Lockout	BOOL	FALSE	Drive switch-on lock is active
ActVelocity	REAL	0.0	Actual speed of the drive
Error	BOOL	FALSE	Drive error active

Name	Type	Start value	Function
Status	WORD	0	Display status values: 16#7002: No error present 16#8401: Error active in drive 16#8402: Switch-on lock active 16#8600: DPRD_DAT error 16#8601: DPWR_DAT error
DiagId	WORD	0	Advanced communication fault (error when calling an instruction)

Parameterization

The HWIDSTW and HWIDZSW block inputs must point to the hardware identifier of the standard telegram.

Figure 2-3: Telegram slot assignments



When using a PROFINET connection between the SIMATIC controller and the SINAMICS G120 drive, the same hardware identifier must always be parameterized for the HWIDSTW and HWIDZSW block inputs.

Note

If required, you can use the add-on blocks for DriveLib to connect the input parameter ConfigAxis ([4](#))

Note

You can find more information about the "SinaSpeed" block in the TIA Portal Online Help.

Operation

After you have connected the inputs and outputs at the "SinaSpeed" function block, you can specify the desired setpoint speed at the "SpeedSp" input and start the motion by setting the "Enable" input.

If you change the value of the speed setpoint, the drive changes the actual speed.

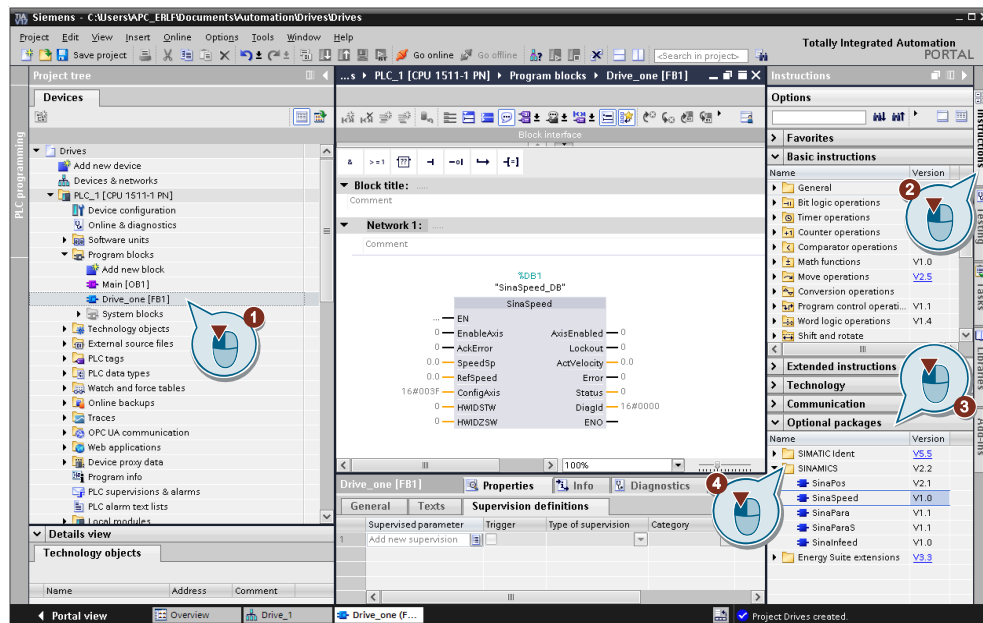
Resetting the "Enable" input causes the drive to stop.

2.3 Reading and writing parameters with "SinaPara"

Note

The function block "SinaPara" is included by default in the options packages of the instructions in TIA Portal
(In the block editor (1) under Instructions (2) > Optional packages (3) > SINAMICS (4)).

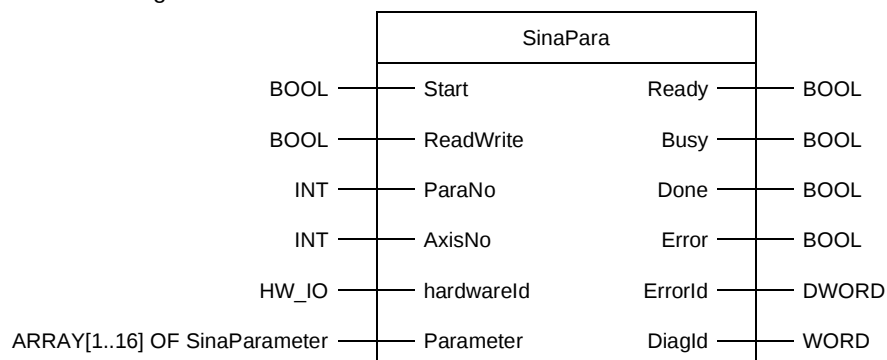
Figure 4 Instructions pre-loaded in TIA Portal



Brief description

With the "SinaPara" function block, up to 16 parameter values can be read acyclically from the drive or written to the drive.

Figure 2-5 "SinaPara" block call



Block parameters

The following tables list the input and output parameters of the "SinaPara" block.

Table 2-3: "SinaPara" input parameters

Name	Type	Start value	Function
Start	BOOL	FALSE	Job start 0 = no job / cancel job 1 = start and execute job
ReadWrite	BOOL	FALSE	Job type 0 = read Parameters 1 = write parameters
ParaNo	INT	1	Number of parameters > 1 to 16
AxisNo	INT	1	Axis number / axis ID in multi-axis system
hardwareId	HW_IO	0	Hardware ID of the module access point / actual value telegram slot of the axis or of the drive

Table 2-4: "SinaPara" output parameters

Name	Type	Start value	Function
Ready	BOOL	FALSE	Feedback signal for connection in LAcycCom environment 1 = job finished or job aborted (one cycle long)
Busy	BOOL	FALSE	Job in progress
Done	BOOL	FALSE	Job finished
Error	BOOL	FALSE	Fault active
ErrorId	DWORD	0	First Word: Binary-coded, indicating which parameter access is faulted Second word: Type of fault
DiagId	WORD	0	Communication failure

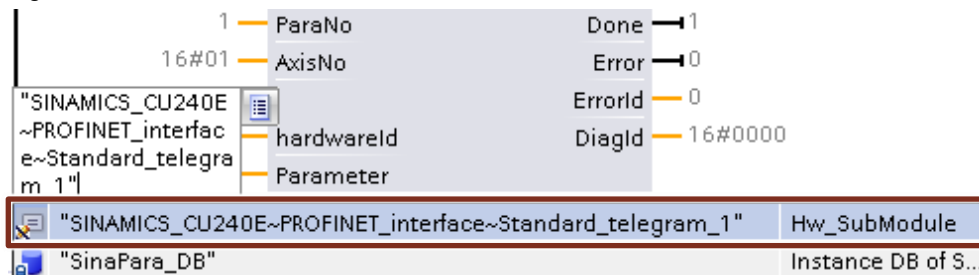
Note

You can find more information about the "SinaPara" block in the TIA Portal Online Help.

Parameterization

The HWIDSTW and HWIDZSW block inputs must point to the hardware identifier of the standard telegram.

Figure 2-6: "hardwareId" interconnections



Operation

To select the parameters to be read, the input parameter "Parameter" is used with the data type "SinaParameter".

Table 2-5: Data type SinaParameter

Name	Type	Start value	Description
siParaNo	UINT	0	Parameter number (1..65535)
siIndex	UINT	0	Subindex of the parameter (1..65535)
srValue	REAL	0.0	Parameter value to read/write (for all data types except DINT and DWORD)
sdValue	DINT	0	Parameter value to read/write (for parameters with DINT and DWORD data types)
syFormat	BYTE	16#0	Parameter format: - Zero = 0x40 - Byte = 0x41/0x02/0x05 - Word = 0x42/0x03/0x06 - DWord = 0x43/0x04/0x07/0x08 - Error = 0x44
swErrorNo	WORD	16#0	Error number

Enter the number of the parameter you want to read or write and, if applicable, the subindex of the parameter in the "siParaNo" and "siIndex" tags of the respective array element of the input parameter "Parameter". If you want to write the parameter to the drive, also enter the value you wish to write in "sdValue" (for parameters with the data type DINT or DWORD) or "srValue" (for parameters with all other data types).

Set the input parameter "ReadWrite" to "TRUE" if you want to write parameters to the drive. Set it to "FALSE" if you want to read the parameters from the drive. Then specify the parameter "ParameterNo" for how many parameters you want to read or write.

To read or write the parameters, set "Start". When the parameters have been read or written, the "Done" output changes from "FALSE" to "TRUE". The values that were read are output via the parameter "Parameter[x].srValue" or "Parameter[x].sdValue".

2.4 Controlling the safety functions of the SINAMICS G120

The S7-1200F CPU sends a Safety control word 1 to the SINAMICS G120. The bits in Safety control word 1 are used to specify which of the Safety Integrated functions in the SINAMICS G120 should be active and which should be deactivated.

The bits in Safety status word 1 indicate that a Safety Integrated function is being accessed.

In the example, only the Safety Integrated function "Safe Torque Off" (STO) of the SINAMICS G120 is used to cause the drive to lose torque in a safe fashion.

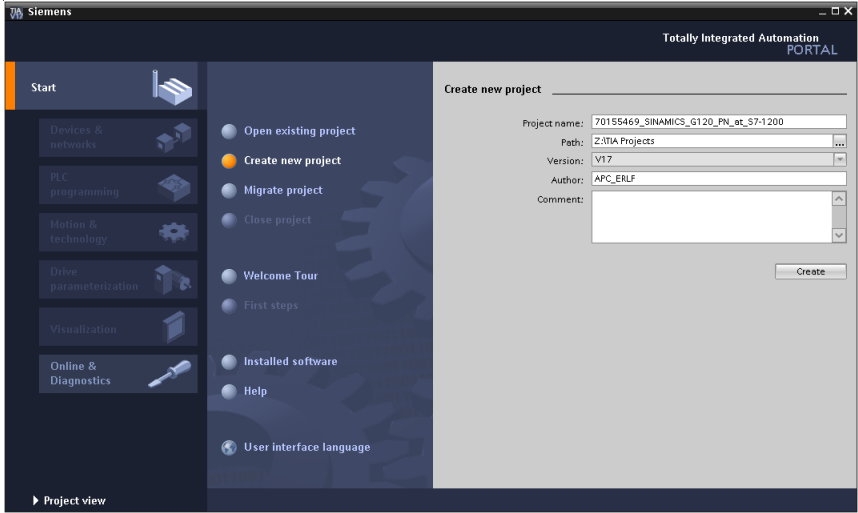
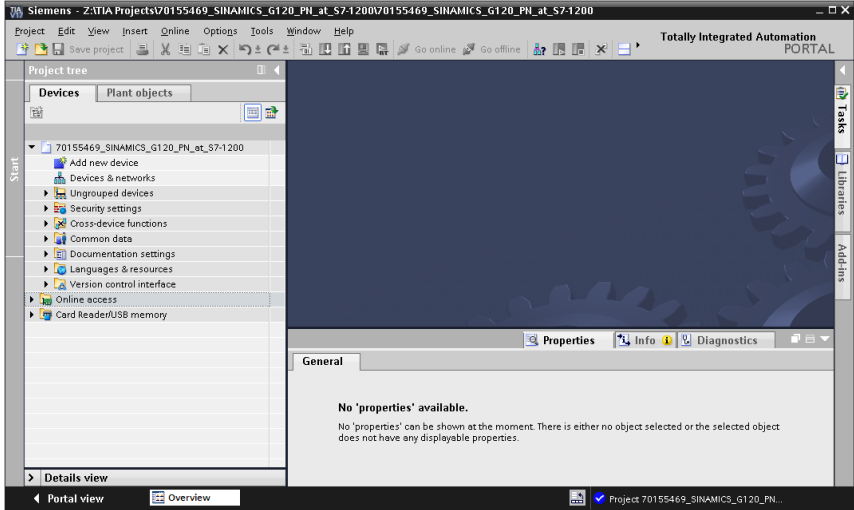
The transmission of the Safety control or status word via PROFINET is also automatically secured against tampering/falsification with PROFINsafe, so that the communication between the devices also meets the more stringent requirements for safe operation.

3 Engineering

This section explains in detail the configurations for the SINAMICS G120 and the S7-1200 CPU in TIA Portal.

3.1 Creating a new project

Table 3-1 Creating a new project

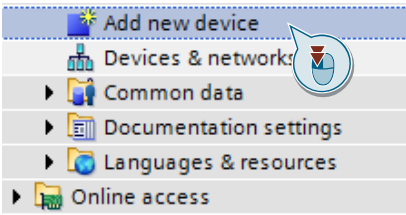
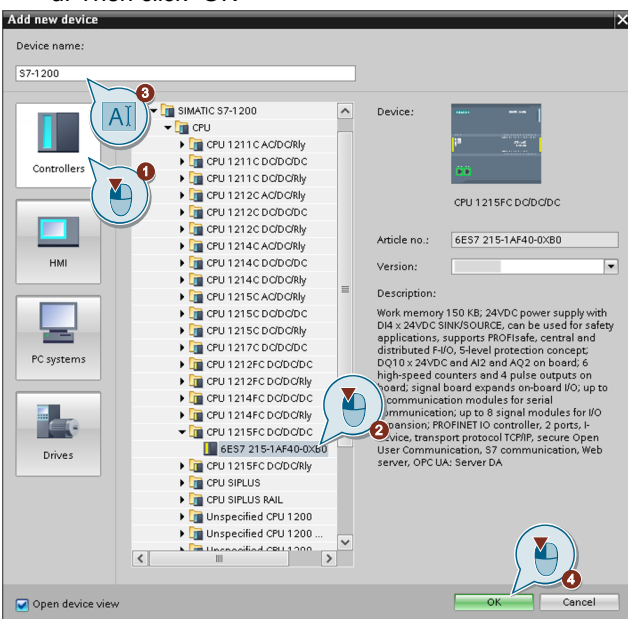
No.	Action	Comments
1.	Open TIA Portal and create a new project: 	
2.	Switch to the "Project view": 	

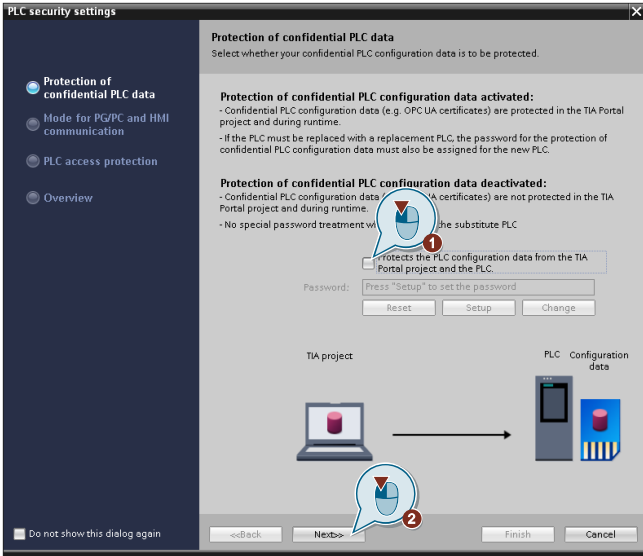
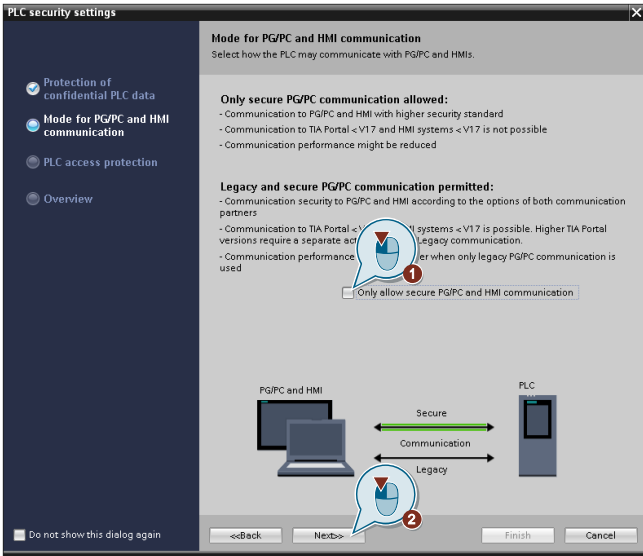
3.2 Configuring the equipment

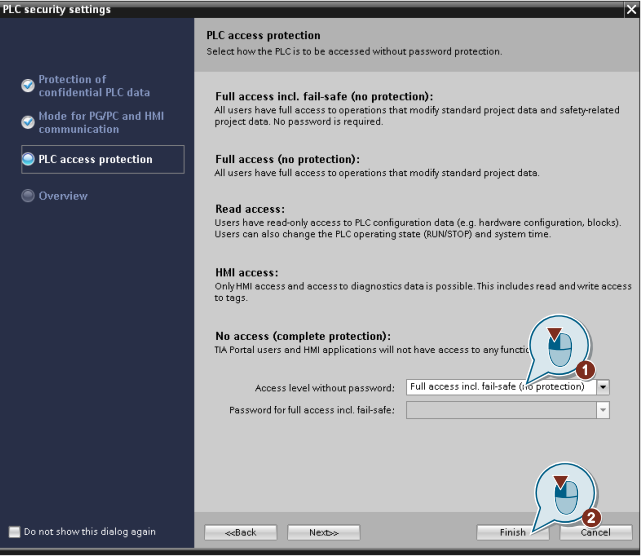
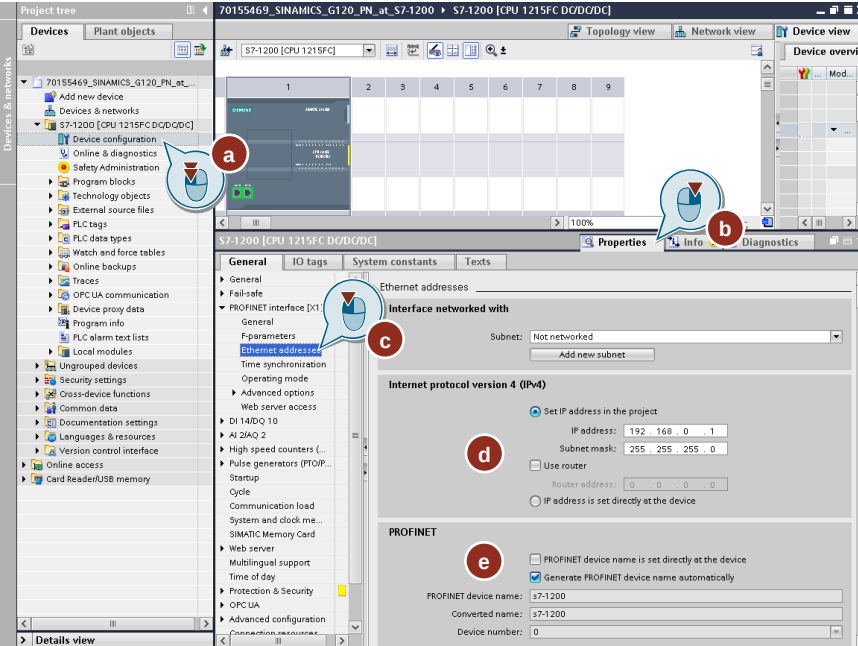
The following chapters describe the configuration of the S7-1200 and the SINAMICS G120 drive. The configuration of the optional operator device is not described in more detail in this application example.

3.2.1 Configuration of the SIMATIC S7-1200

Table 3-2: Creation of the project configuration

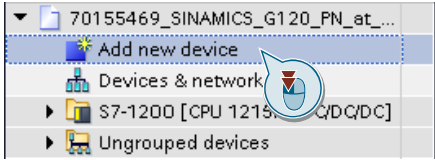
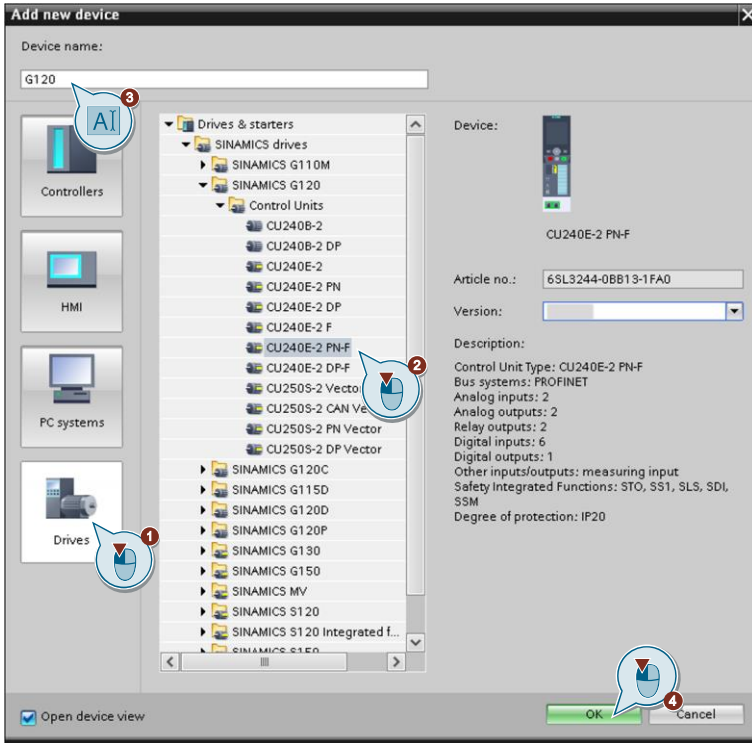
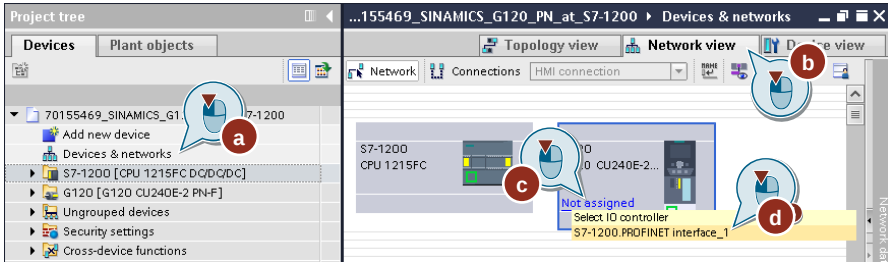
No.	Action	Note
1.	Double-click on "Add new device": 	
2.	Add the controller you are using: a. Select "Controller" b. Select the desired CPU c. Enter a name for the device, if applicable d. Then click "OK" 	

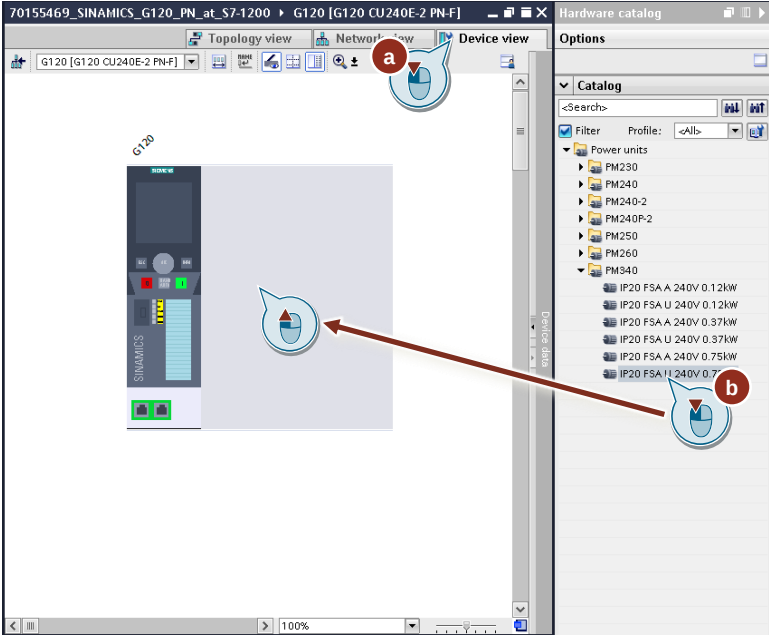
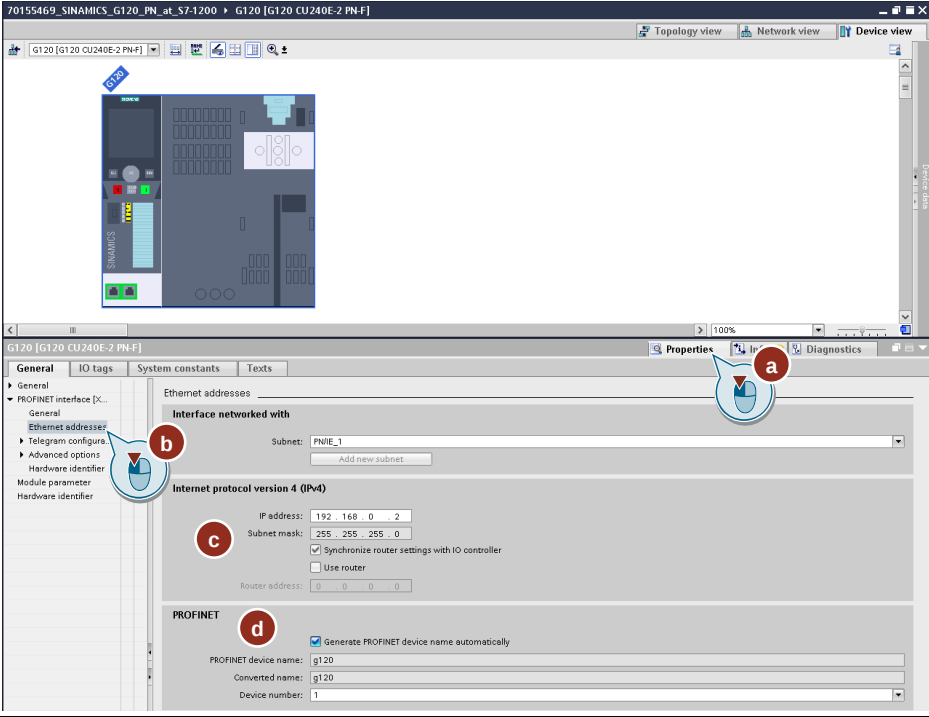
No.	Action	Note
3.	For the test project, uncheck the box for protecting sensitive data on the PLC. Confirm with "Next": 	The test project does not involve any confidential data on the controller. If you have data on your controller that need to be safeguarded, assign a password instead of unchecking the box.
4.	For the test project, uncheck the box "Only allow secure PG/PC and HMI communication": 	In the test project, it is permissible to access the controller via an unsecured PG/PC and HMI communication. Depending on the security policies required by the machine, you might be required to set up more stringent access protection.

No.	Action	Note
5.	Set up access protection on the controller and assign a password if applicable. Confirm the configuration with "Finish": 	In the test project, full access without password protection is activated on the controller. Depending on the security policies required by the machine, you might be required to set up more stringent access protection.
6.	Then configure the CPU's PROFINET interface in the device configuration: - Open the Device view of the CPU. - Open the Properties of the CPU. - Select "Ethernet addresses". - Enter the desired IP address and subnet mask. - If necessary, assign the PROFINET device name. 	The default address "192.168.0.1" is used for the test project. You can also use a different IP address if needed.
7.	Save the project.	

3.2.2 Configuration of the SINAMICS G120

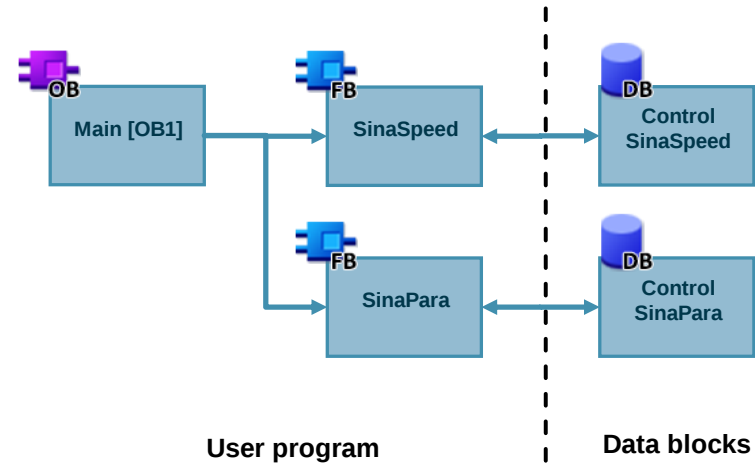
Table 3-3: Adding the drive

No.	Action	Note
1.	Double-click on "Add new device": 	
2.	Add the SINAMICS G120 drive you are using: - Select "Drives" - Select the desired drive - Enter a name for the device - Then click "OK" 	
3.	Connect the SINAMICS G120 drive with the SIMATIC S7-1200 controller: - Click on "Devices and networks" - Change to the "Network view" - Click on "Not assigned" on the SINAMICS G120 - Select the PROFINET interface of the S7-1200 	

No.	Action	Note
4.	Assign a power module to the drive you added: a. Select the "Device view" b. Select the power module you are using from the hardware catalog and add it to the drive 	This step is omitted when using a G120C drive.
5.	Then configure the PROFINET interface of the drive in the device configuration: a. Open the properties of the drive b. Select "Ethernet addresses" c. Enter the desired IP address and subnet mask d. If necessary, assign the PROFINET device name. 	
6.	Save the project.	

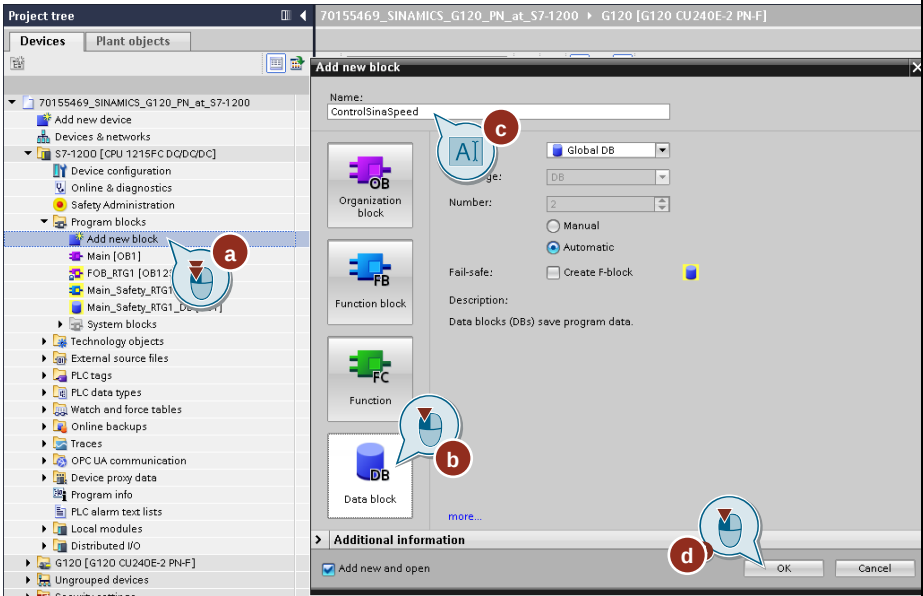
3.3 Creating the user program

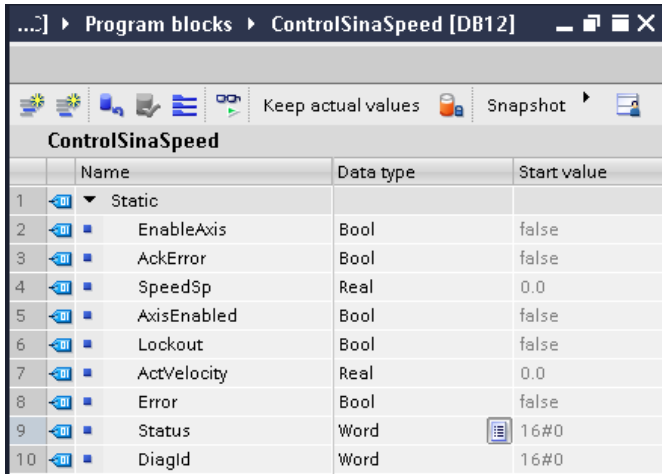
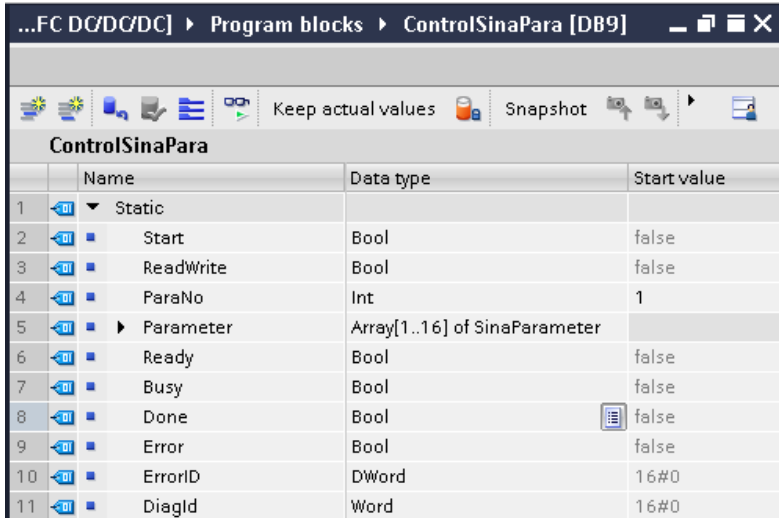
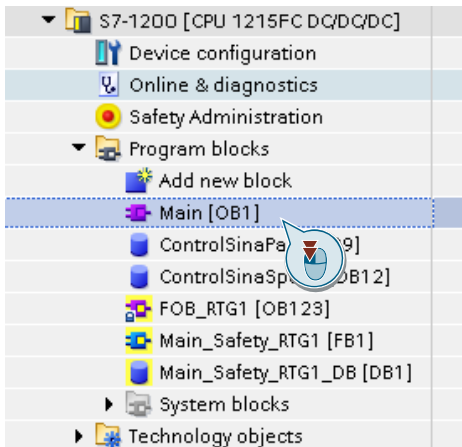
The structure of the user program of this application example is shown in the following graphic:

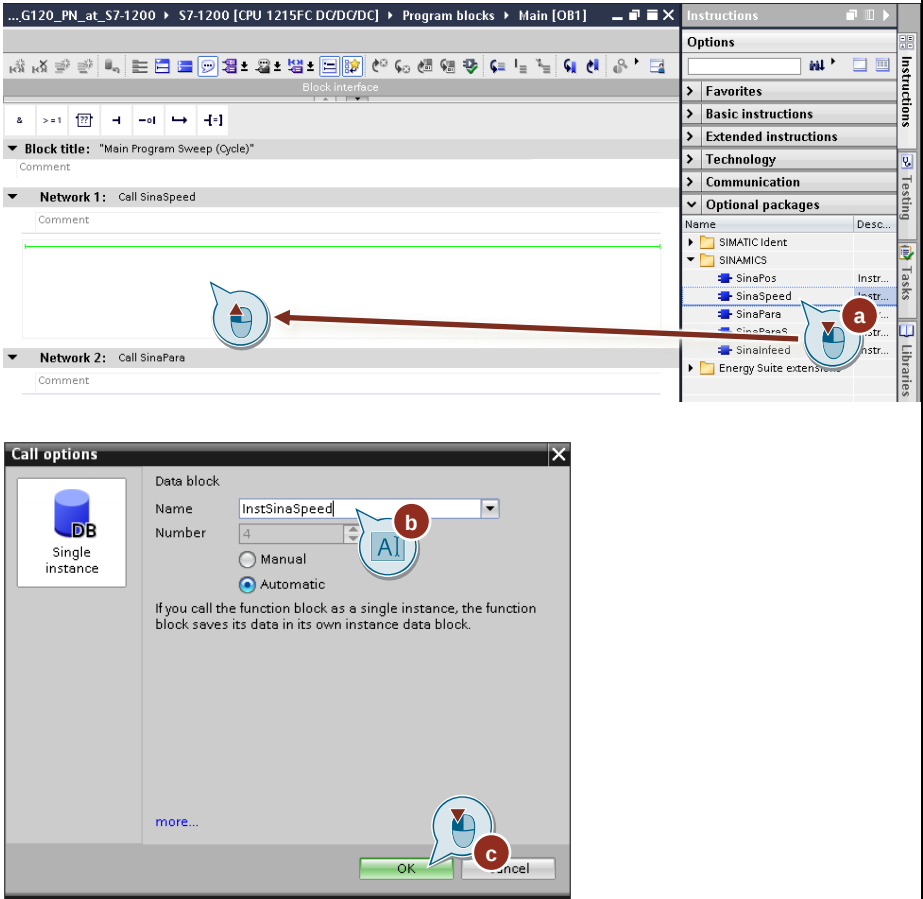


The steps required to create the user program are shown in the following table:

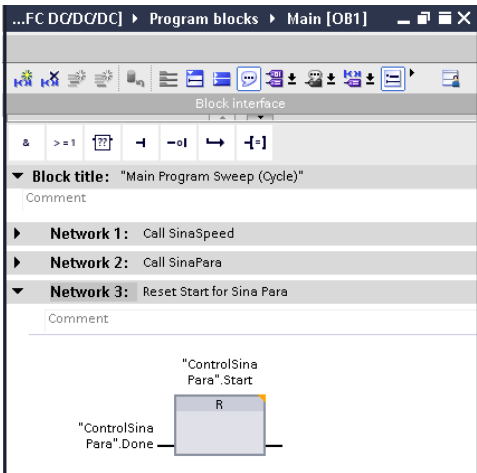
Table 3-4: Configuring the S7 program

No.	Action	Note
1.	Create two data blocks: "ControlSinaSpeed" and "ControlSinaPara": - In the project tree, under the SIMATIC S7-1200 > "Program blocks", double-click on "Add new block" - Select "Data block" - Assign the names ("ControlSinaSpeed" and "ControlSinaPara") - Add the data block by clicking "OK" 	Perform steps "a" through "c" twice to create both data blocks, "ControlSinaSpeed" and "ControlSinaPara".

No.	Action	Note
2.	Create the following tags in the data blocks: ControlSinaSpeed:  ControlSinaPara: 	The data blocks are used to control the "SinaPara" and "SinaSpeed" functions. If you integrate these blocks into an existing user program, you will generally not need any extra data blocks.
3.	Open the "Main" (OB1) organization block in the "Program blocks" of the SIMATIC S7-1200: 	

No.	Action	Note
4.	Insert a call to each of the function blocks "SinaSpeed" and "SinaPara" in the organization block "Main" (OB1): - Drag each block from "Instructions" > "Optional packages" into a network of "Main" (OB1) - Assign a name and, if necessary, a number for the instance data block - Confirm with "OK" 	Perform steps "a" through "c" for both the "SinaSpeed" and "SinaPara" blocks.

No.	Action	Note
5.	Connect the inputs and outputs of the "SinaSpeed" and "SinaPara" blocks as shown in the following screenshots: SinaSpeed: SinaPara:	Caution: The input "RefSpeed" of the "SinaSpeed" block depends on the configuration of the SINAMICS G120 and should be harmonized with p2000 of the SINAMICS G120 before use.

No.	Action	Note
6.	Add another network and program the instruction shown in the following screenshot: 	The instruction automatically resets the start command for "SinaPara" once processing is complete.
7.	Save and compile the project.	

3.4 Safety configuration and programming

In the test project of this application example, the Safety Integrated function "Safe Torque Off" (STO) of the SINAMICS G120 is used to cause the drive to safely lose torque. The Safety Integrated function is controlled by the SIMATIC S7-1200F via PROFIsafe.

Note

Safety configuration and programming is optional. The "SinaSpeed" and "SinaPara" instructions, which are used to move the drive and to read or write parameters to/from the drive, can be used independently of Safety configuration and programming.

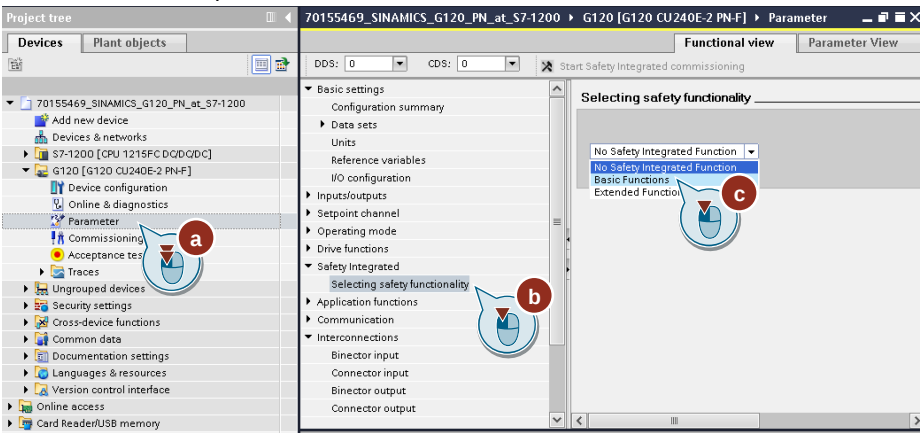
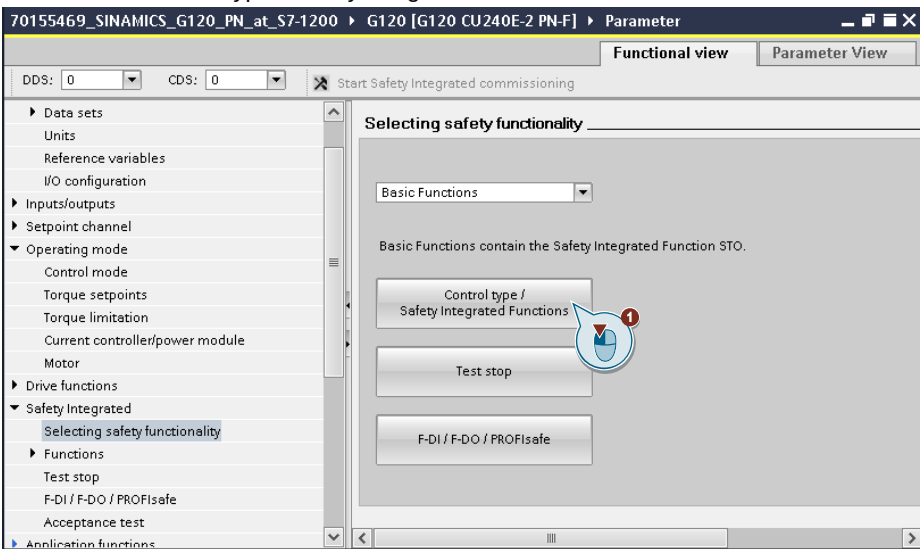
Note

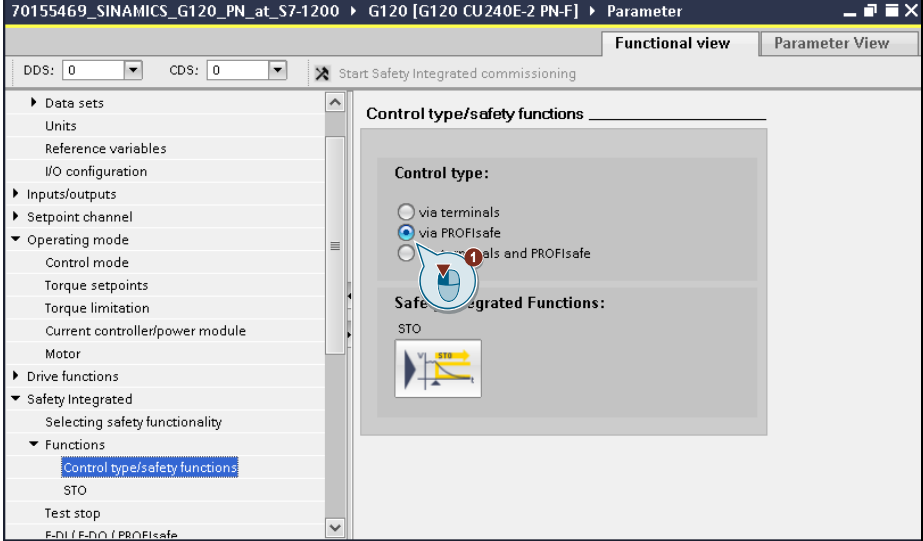
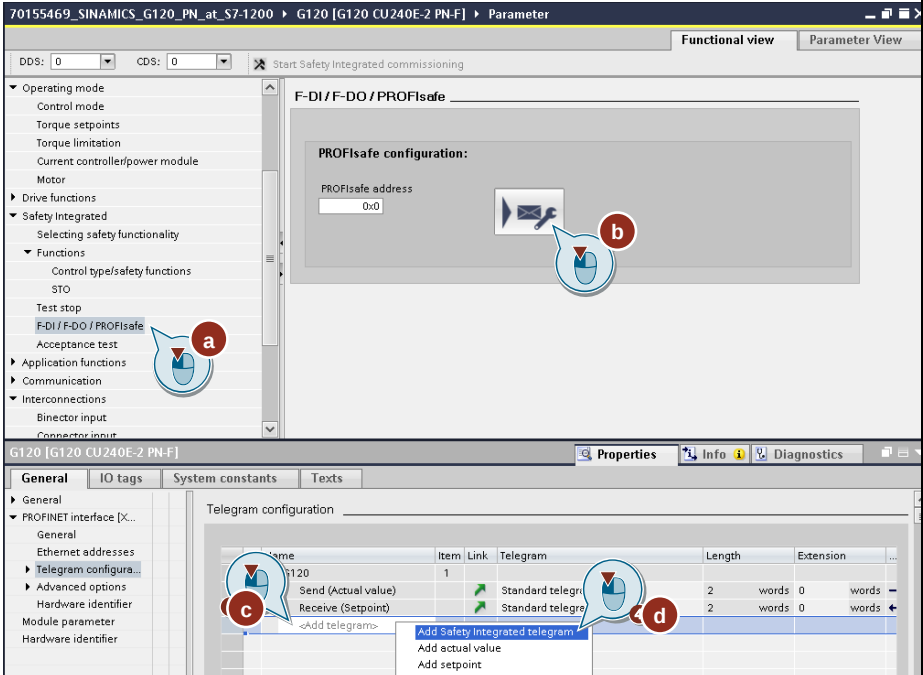
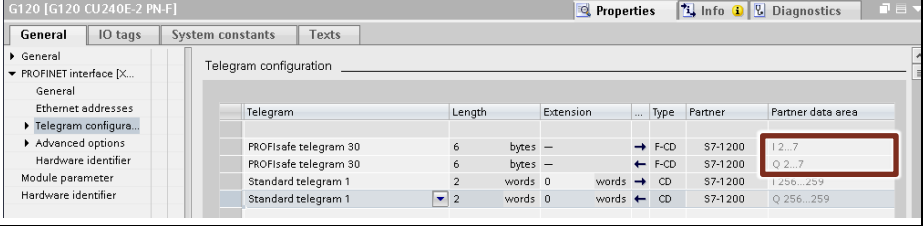
In order to control the Safety Integrated functions on the SINAMICS G120 via the SIMATIC S7-1200 with PROFIsafe, a SIMATIC S7-1200F CPU and a SINAMICS G120 Control Unit with Safety functionality are required.

3.4.1 Safety Integrated configuration of the SINAMICS G120

Follow these steps to configure Safety Integrated on the SINAMICS G120.

Table 3-5: Safety Integrated configuration of the SINAMICS G120

No.	Action	Note
1.	Activate the Safety Integrated "Basic Functions": - Open the parameterization of the SINAMICS G120 - Navigate to "Safety Integrated" > "Selecting safety functionality" - From the drop-down menu, select "Basic functions" 	
2.	Click on the "Control type / Safety Integrated functions" button: 	

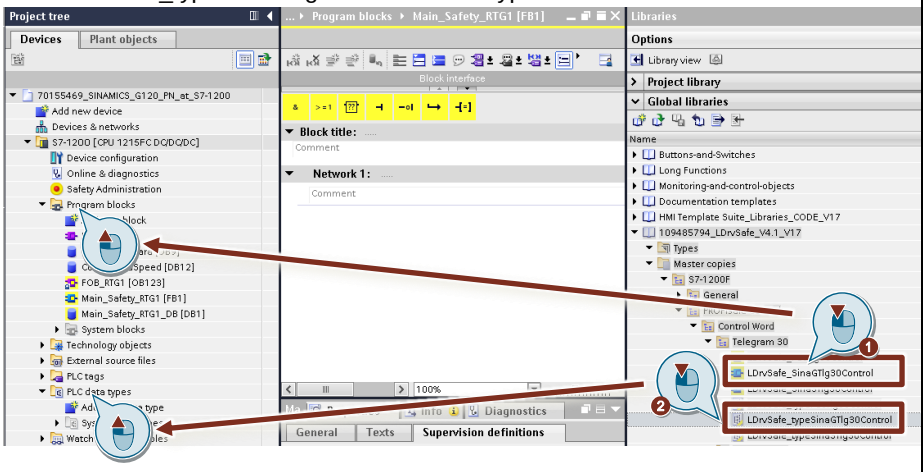
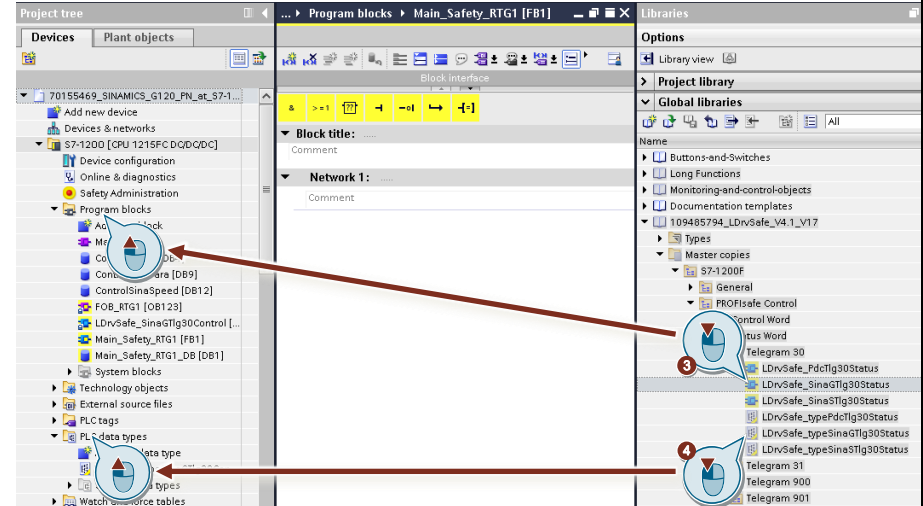
No.	Action	Note
3.	Select "via PROFIsafe": 	
4.	Add the Safety Integrated telegram "Telegram 30" in the telegram configuration: - Click on "F-DI / F-DO / PROFIsafe" - Click on the icon with the letter and wrench to open the telegram configuration - Click on "Add telegram". - Click on "Add Safety Integrated telegram" 	
5.	Make a note of the input and output addresses of PROFIsafe telegram 30: 	
6.	Save the project.	

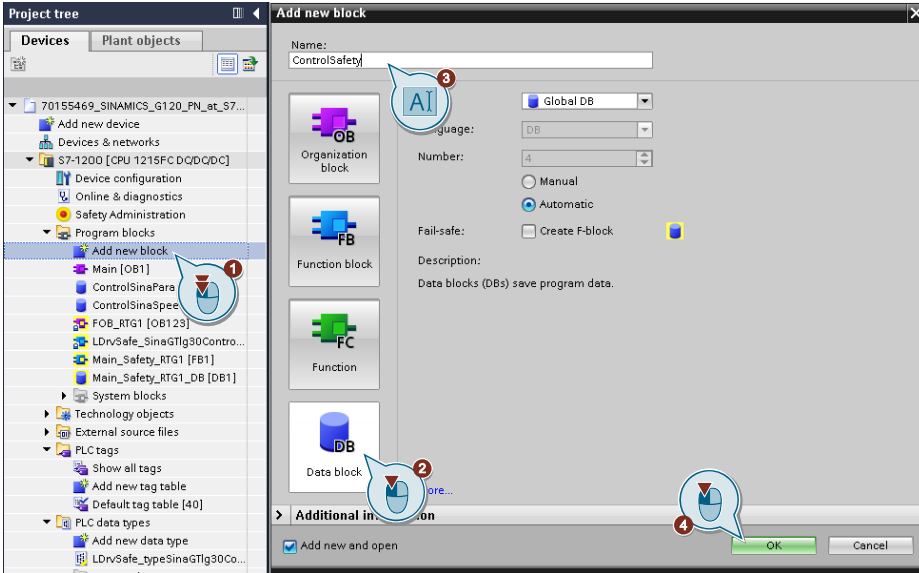
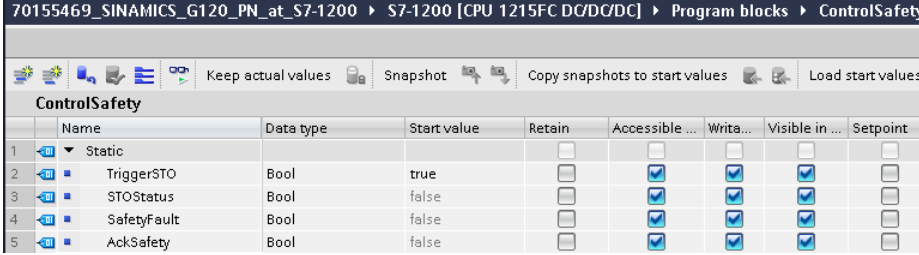
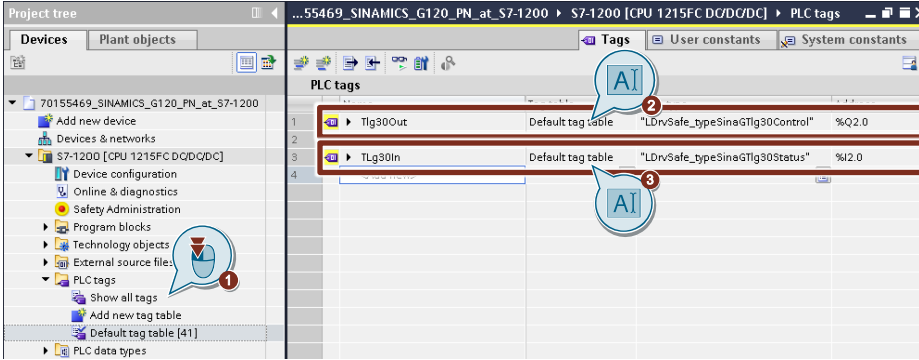
3.4.2 Safety configuration and programming on the SIMATIC S7-1200

Note The failsafe library "LDrvSafe" is used to control the Safety Integrated function "STO" via PROFIsafe. The library is available as a free download from Siemens Industry Support ([15](#)).

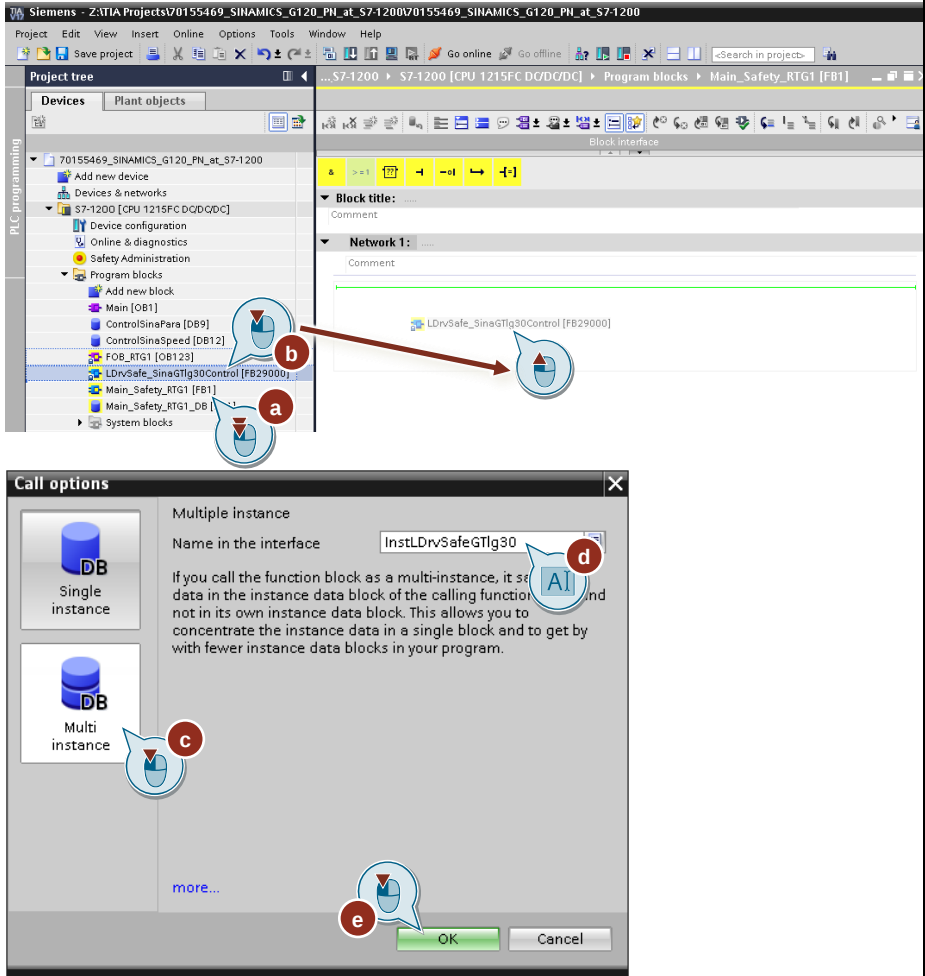
Perform the following steps to control the Safety Integrated functions on the SIMATIC S7-1200F:

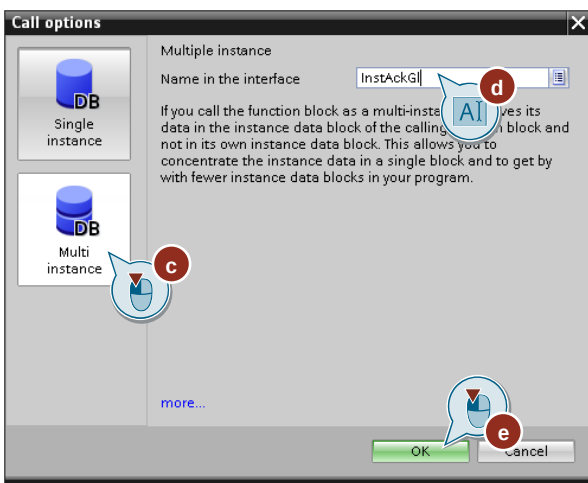
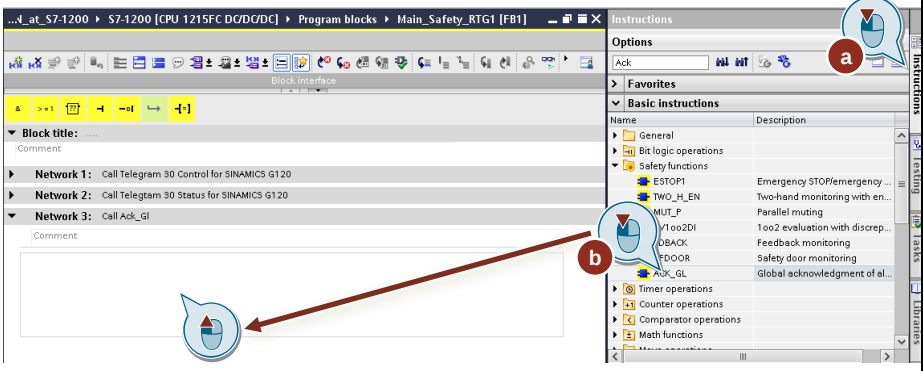
Table 3-6: Safety configuration and programming on the SIMATIC S7-1200F

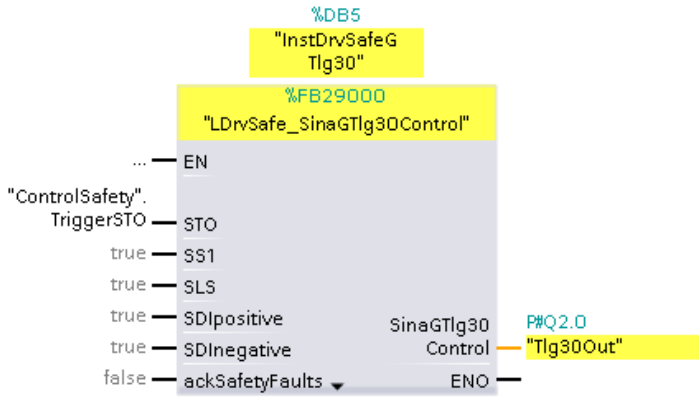
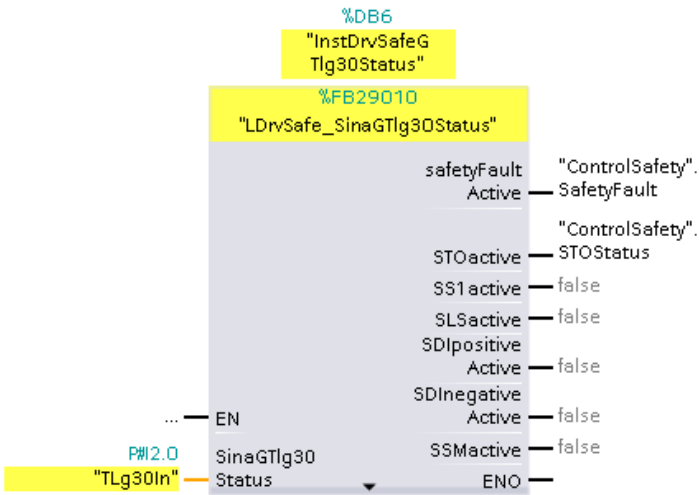
No.	Action	Note
1.	Add the following function blocks and data types for the SIMATIC S7-1200F from the "LDrvSafe" library to your project: "LDrvSafe_SinaGTlg30Control" function block "LDrvSafe_typeSinaGTlg30Control" data types  "LDrvSafe_SinaGTlg30Status" function block "LDrvSafe_typeSinaGTlg30Status" data types 	The steps to open and use the "LDrvSafe" library are described in the manual (15).

No.	Action	Note
2.	Create a new "ControlSafety" data block in the project: - In the project tree, under the SIMATIC S7-1200 > "Program blocks", double-click on "Add new block" - Select "Data block" - Assign the name "ControlSafety". - Add the data block by clicking "OK" 	
3.	Create tags in the "ControlSafety" data block as shown in the following screenshot: 	
4.	Add the output data to control the Safety Integrated functions on the SIMATIC S7-1200: - Open the PLC tags by clicking on "Show all tags". - Add a tag "Tlg30Out" with the data type "LDrvSafe_typeSinaGTlg30Control". Set the address as the source address you noted in chapter 3.4.1, Step 5. - Add a tag "Tlg30In" with the data type "LDrvSafe_typeSinaGTlg30Status". Set the address as the input address you noted in chapter 3.4.1, Step 5. 	

No.	Action	Note
5.	Add block calls for "LDrvSafe_SinaGTlg30Control" and "LDrvSafe_SinaGTlg30Status" in the block "Main_Safety_RTG1": - Open the block "Main_Safety_RTG1" - Drag the "LDrvSafe_SinaGTlg30Control" block into the first network - Select "Multi instance" - Assign an instance name - Confirm with "OK" - Repeat steps "a" through "e" with the block "LDrvSafe_SinaGTlg30Status"	



No.	Action	Note
6.	Insert an instance of the block ACK_GL from the Basic Instructions into "Main_Safety_RTG1": - Open the "Instructions" - Drag the block "ACK_GL" into a network of "Main_Safety_RTG1" - Select "Multi instance" - Assign an instance name - Confirm with "OK" 	

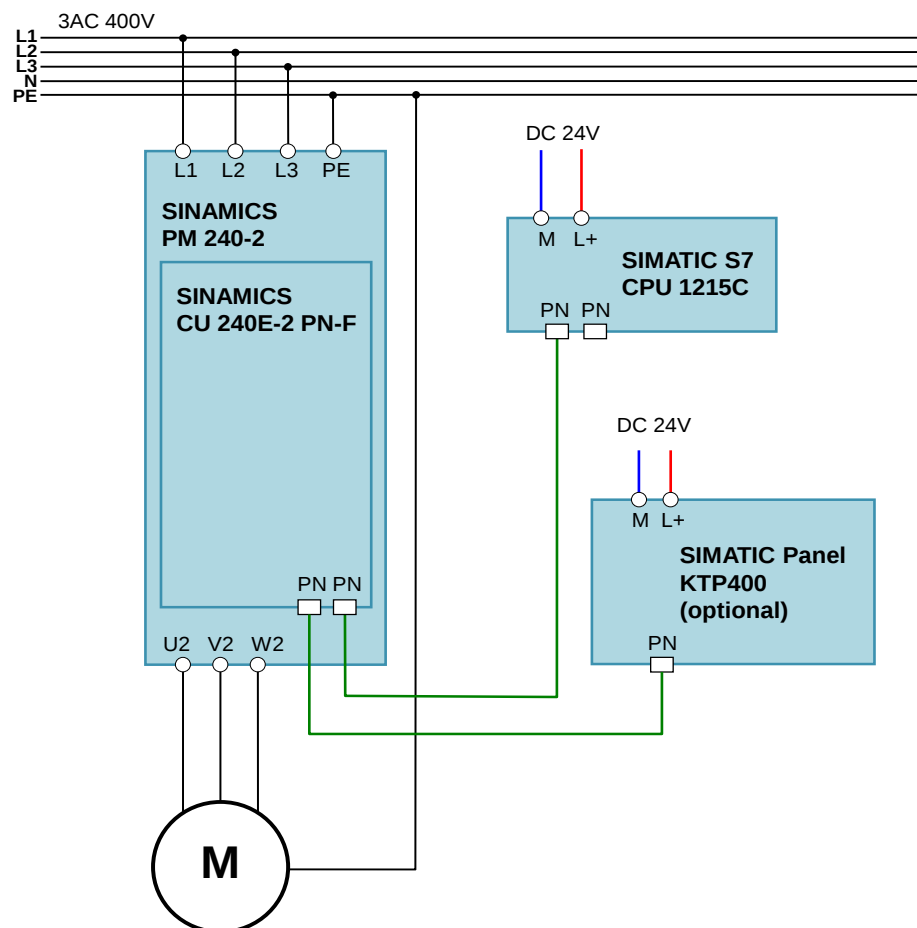
No.	Action	Note
7.	Connect the blocks as shown in the following screenshot: Network 1: Call Telegram 30 Control for SINAMICS G120 Comment  Network 2: Call Telegram 30 Status for SINAMICS G120 Comment  Network 3: Call Ack_Gl Comment 	Caution: The test project uses the non-failsafe tag "ControlSafety.TriggerSTO" to control the STO function of the SINAMICS G120. In a real-world project, the entire shutdown path must be failsafe. Triggering Safety functions via non-failsafe tags, or inputs from the user program, is not sufficient. In this case, the Safety function must be triggered via a failsafe digital input, for example.

4 Installation and commissioning

4.1 Hardware setup

The following Figure shows the hardware setup of the application.

Figure 4-1: Hardware setup



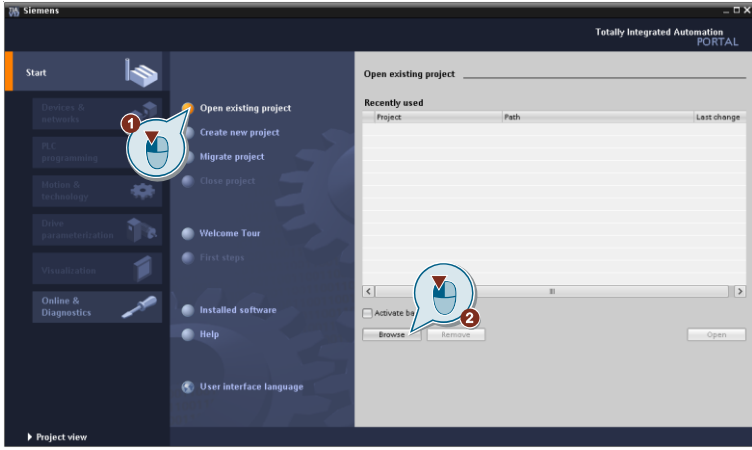
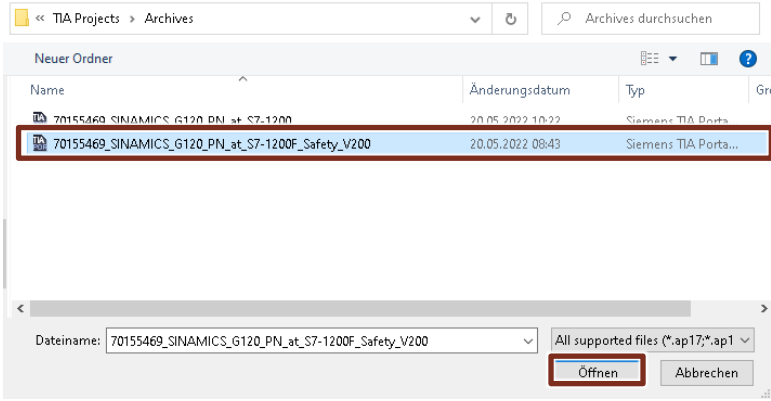
Note

Observe the setup guidelines for SINAMICS drives and SIMATIC controllers at all times.

4.2 Extracting the example project

If you did not create the project yourself, as an option you can also use the example project from this application example. Follow the steps below to open the example project:

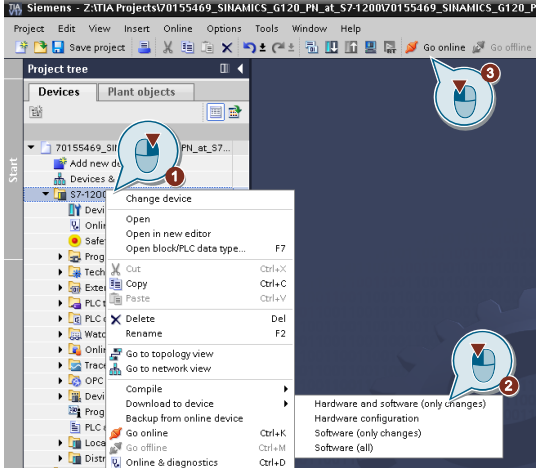
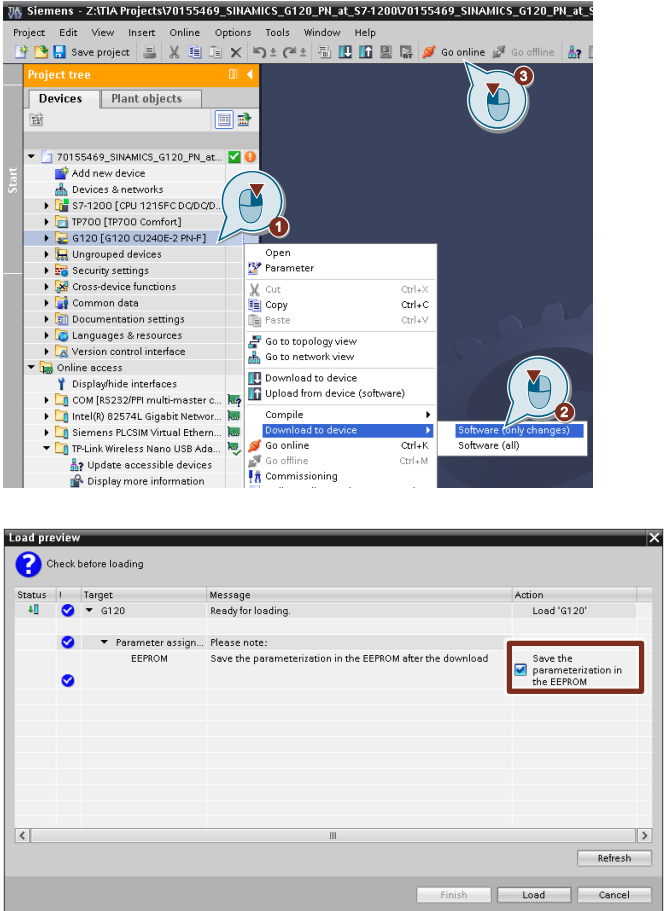
Table 4-1 Extracting the example project

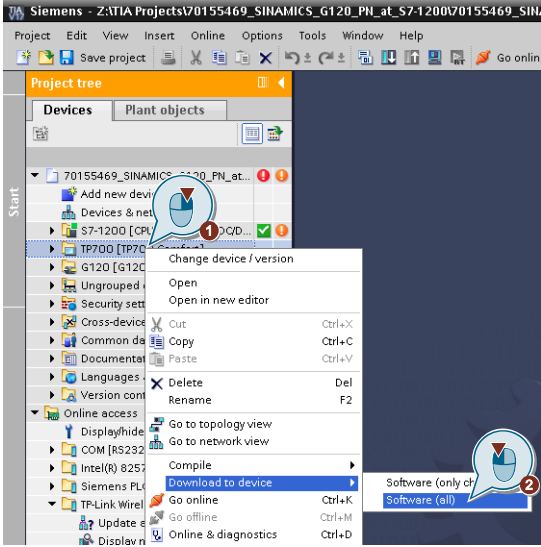
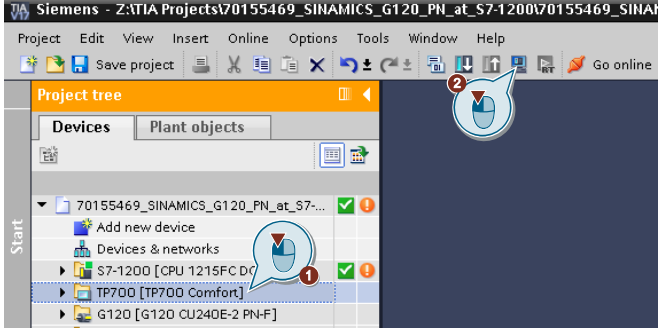
No.	Action	Comments
1.	Find the project (available in ZIP format) entitled "70155469_SINAMICS_G120_PN_at_S7-1200_V200.zip" and extract it to a local directory.	
2.	Launch TIA Portal and click in the "Portal view" on "Open existing project" → "Browse": 	
3.	Select the locally saved project and confirm with "Open": 	
4.	Select the destination path to which the project will be extracted.	
5.	The application is now ready to run. It can be commissioned as shown in the chapters below.	

4.3 Downloading the project

Perform the following steps to download the project to the drives and the controller:

Table 4-2 Downloading the project

No.	Action	Comments
1.	Download the project to the SIMATIC S7-1200 controller and establish an online connection to the device: 	
2.	Download the parameter assignment to the SINAMICS G120 drive and establish an online connection. During the download, enable the option "Save the parameterization in the EPROM" in order to save the parameter assignment in the retentive memory of the drive. 	

No.	Action	Comments
3.	Optional: Download the project to the TP700 Comfort Panel:  If you are not using a real Panel, you can also simulate the HMI: 	In order for the HMI simulation to work, the PG/PC interface must be set correctly.

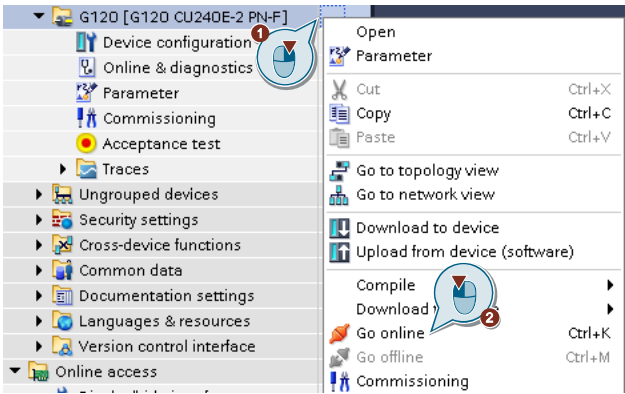
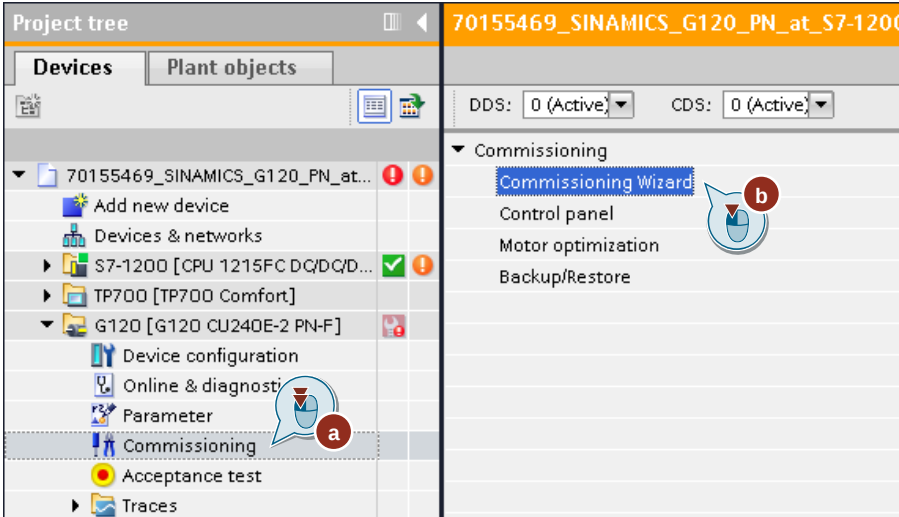
4.4 Commissioning the SINAMICS G120

After creating the project configuration and downloading the project to the drive and controller, you can put the SINAMICS G120 drive into operation. We will proceed through the STARTDRIVE Commissioning Wizard to do this.

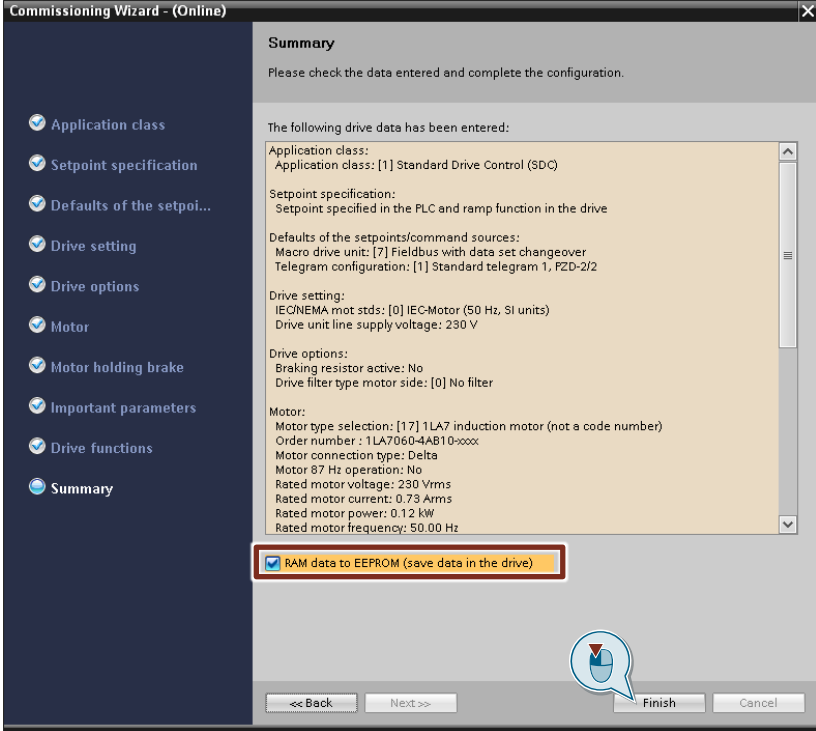
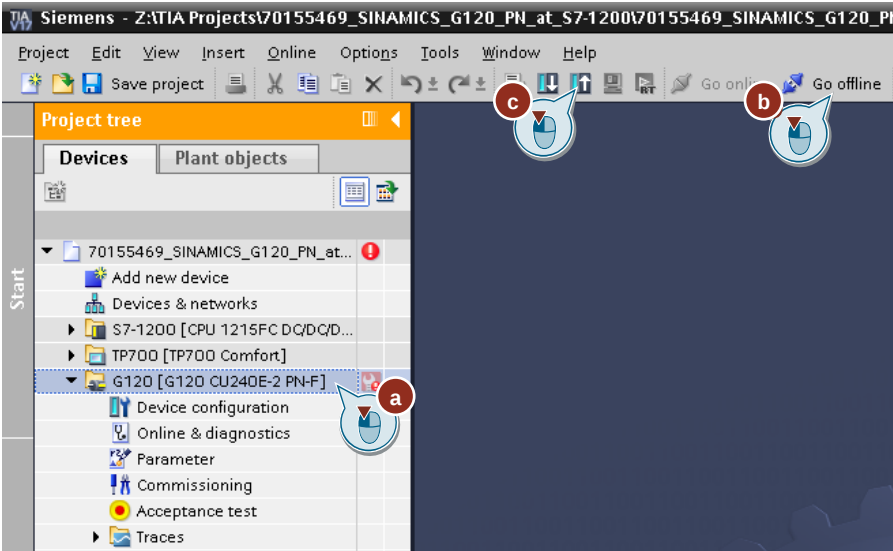
Note

Information on the configuration and commissioning of drives can be found in the TIA Portal Online Help.

Table 4-3: Commissioning the drive

No.	Action	Note
4.	Make sure that an online connection to the drive exists. If necessary, go online to the drive. 	
5.	Open the Commissioning Wizard: - In the project tree under the SINAMICS G120, double-click on "Commissioning" - Click on "Commissioning Wizard" 	
6.	Run through the Commissioning Wizard. You can find help with this in the TIA Portal Online Help. In particular, make sure that standard telegram 1 is set for communication to the controller.	

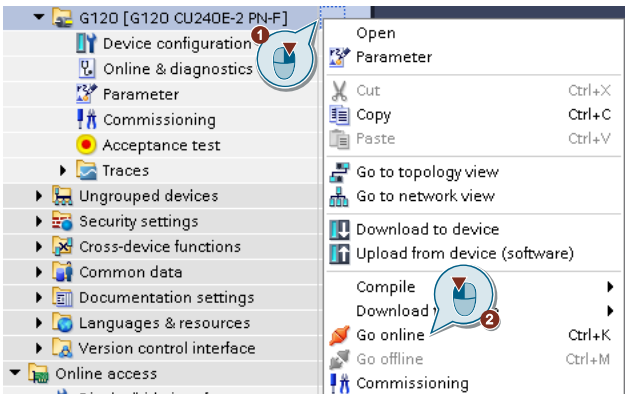
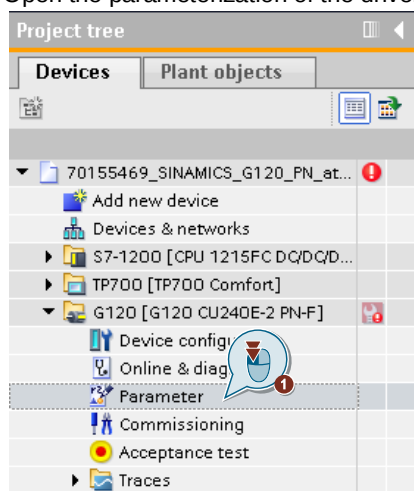
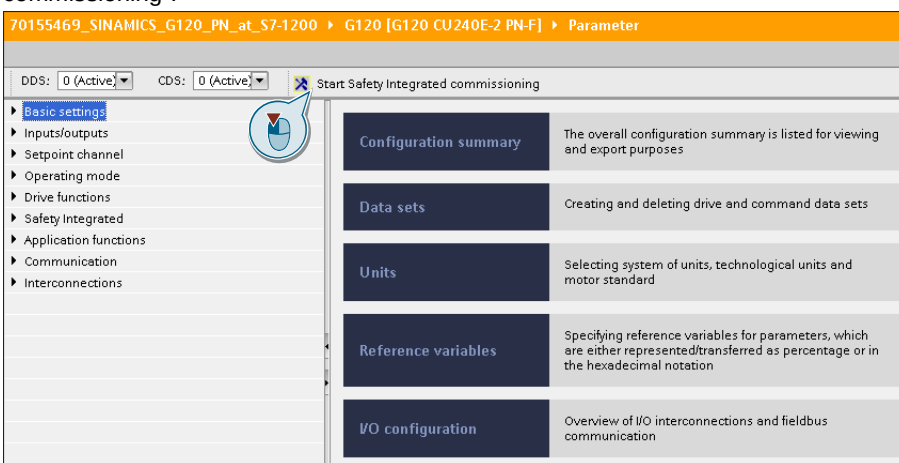
4 Installation and commissioning

No.	Action	Note
7.	To complete the Commissioning Wizard, you need to save the settings of the drive. To do this, select the "RAM data to EEPROM" checkbox and exit the wizard: 	
8.	Switch the drive off and on again to restart the drive and apply the parameterization.	
9.	Then disconnect the online connection to the drive and download the configuration stored in the drive into the offline project: - In the project tree, select the drive - Close the online connection to the drive - Download the drive to the offline project 	
10.	Save the TIA Portal project.	-

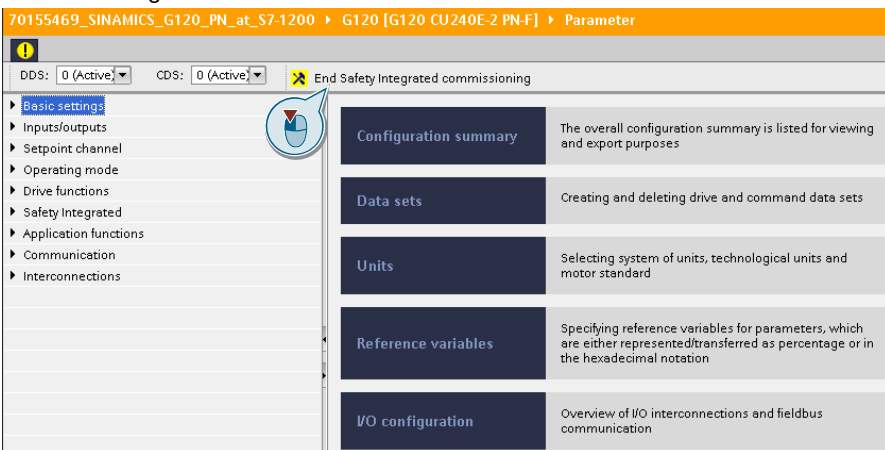
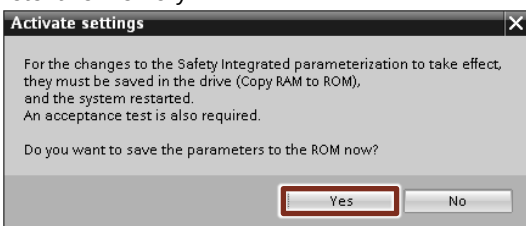
4.5 Safety commissioning

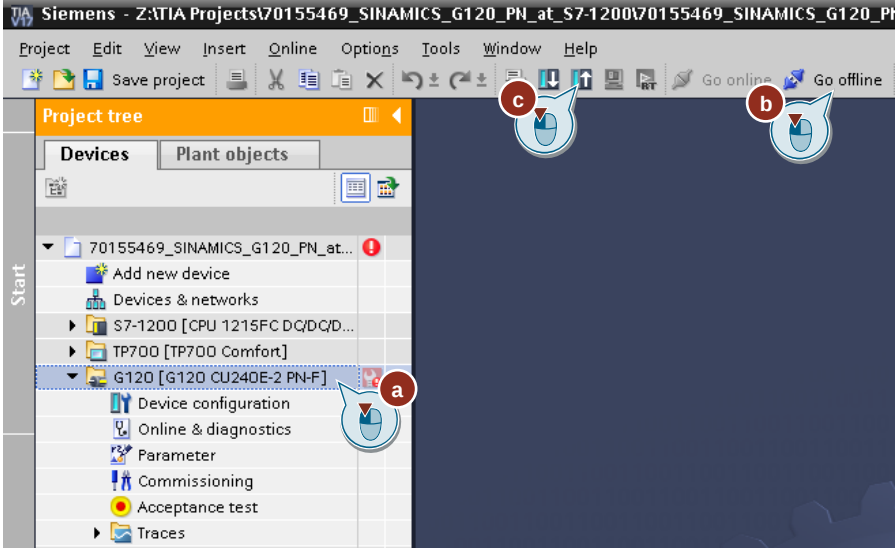
Follow the steps in the table below to get the drive's Safety Integrated functions up and running. This chapter is optional and the steps do not need to be followed if you are not using Safety Integrated features.

Table 4-4: Commissioning the drive

No.	Action	Note
1.	Establish an online connection to the drive: 	
2.	Open the parameterization of the drive: 	
3.	Start Safety Integrated commissioning by clicking on "Start Safety Integrated commissioning": 	

4 Installation and commissioning

No.	Action	Note
4.	Assign a password for the Safety Integrated configuration: 	For the example project, the password "1234" was assigned.
5.	Finish Safety Integrated commissioning by clicking on "End Safety Integrated commissioning": 	
6.	Select "Yes" in the "Activate settings" dialog to save the settings in the drive's retentive memory: 	

No.	Action	Note
7.	Then disconnect the online connection to the drive and download the configuration stored in the drive into the offline project: - In the project tree, select the drive - Close the online connection to the drive - Download the drive to the offline project 	
8.	Switch the drive off and on again to restart the drive and apply the parameterization.	
9.	Save the project.	

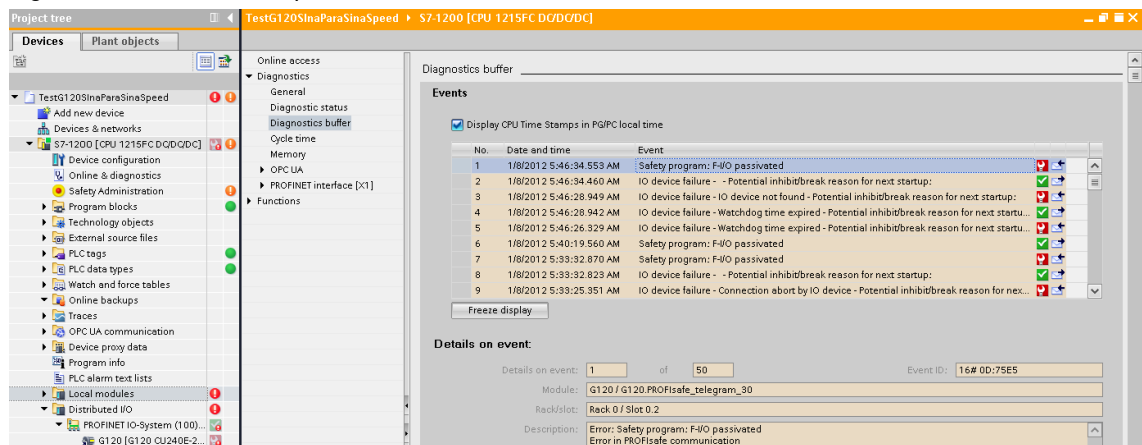
5 How the project works

5.1 Acknowledging passivized I/Os (only for Safety projects)

After the Safety commissioning of the SINAMICS or after a failure of the PROFIsafe connection between the SINAMICS G120 and the SIMATIC S7-1200F, the connection will be passivized and must be acknowledged.

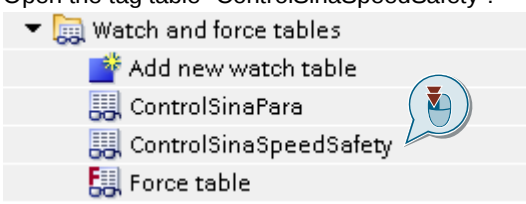
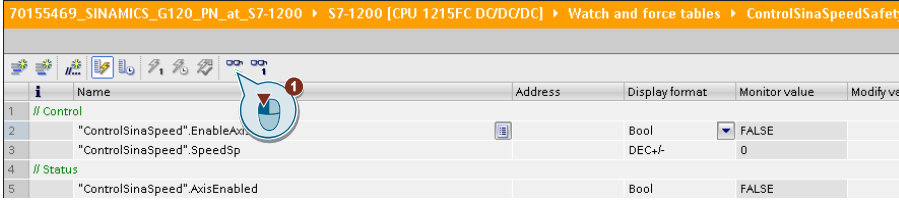
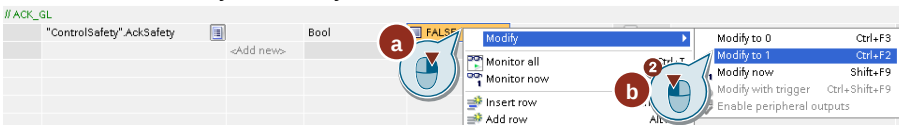
The error is displayed in the diagnostic buffer of the CPU and in the project tree under "Distributed I/O" > "PROFINET IO System (100)" > "G120".

Figure 5-1 Fault state with passivized F I/O



Follow the steps below to acknowledge the error:

Table 5-1 Acknowledging passivized F I/Os

No.	Action	Note
1.	Open the tag table "ControlSinaSpeedSafety": 	
2.	Select "Monitor all" to view the online values in the watch table: 	If there is no online connection to the SIMATIC S7-1200 yet, it will be established automatically after selecting "Monitor all".
3.	Set the tag "ControlSafety.AckSafety": a. Right-click on the tag's table row b. Select "Modify" > "Modify to 1" 	

No.	Action	Note
4.	Reset the "ControlSafety.AckSafety" tag: a. Right-click on the tag's table row b. Select "Modify" > "Modify to 0"	The passivized I/Os have been reintegrated.

5.2 Operation via tag table in the project

The tag tables "ControlSinaSpeed" (SIMATIC S7-1200), "ControlSinaSpeedSafety" (SIMATIC S7-1200F) and "ControlSinaPara" have been created in the project. If you are not using the HMI of the sample project, you can use the tag tables to operate the project instead. Operation is explained below using three example scenarios:

- Moving the drive (SinaSpeed)
- Reading error codes from the SINAMICS G120 (SinaPara)
- Changing the ramp-up time and ramp-down time of the SINAMICS G120 (SinaPara)
- Triggering and resetting of STO in the drive (only with SIMATIC S7-1200F and Safety)

5.2.1 Structure of the tag tables

ControlSinaSpeed(Safety) tag table

The ControlSinaSpeed tag table contains all the tags that are required to move the drive using the "SinaSpeed" instruction. The SinaSpeedSafety tag, which is included in the project with Safety and the SIMATIC S7-1200F, also includes tags for controlling the Safety Integrated Function "STO" of the SINAMICS G120.

Figure 5-2 ControlSinaSpeedSafety tag table

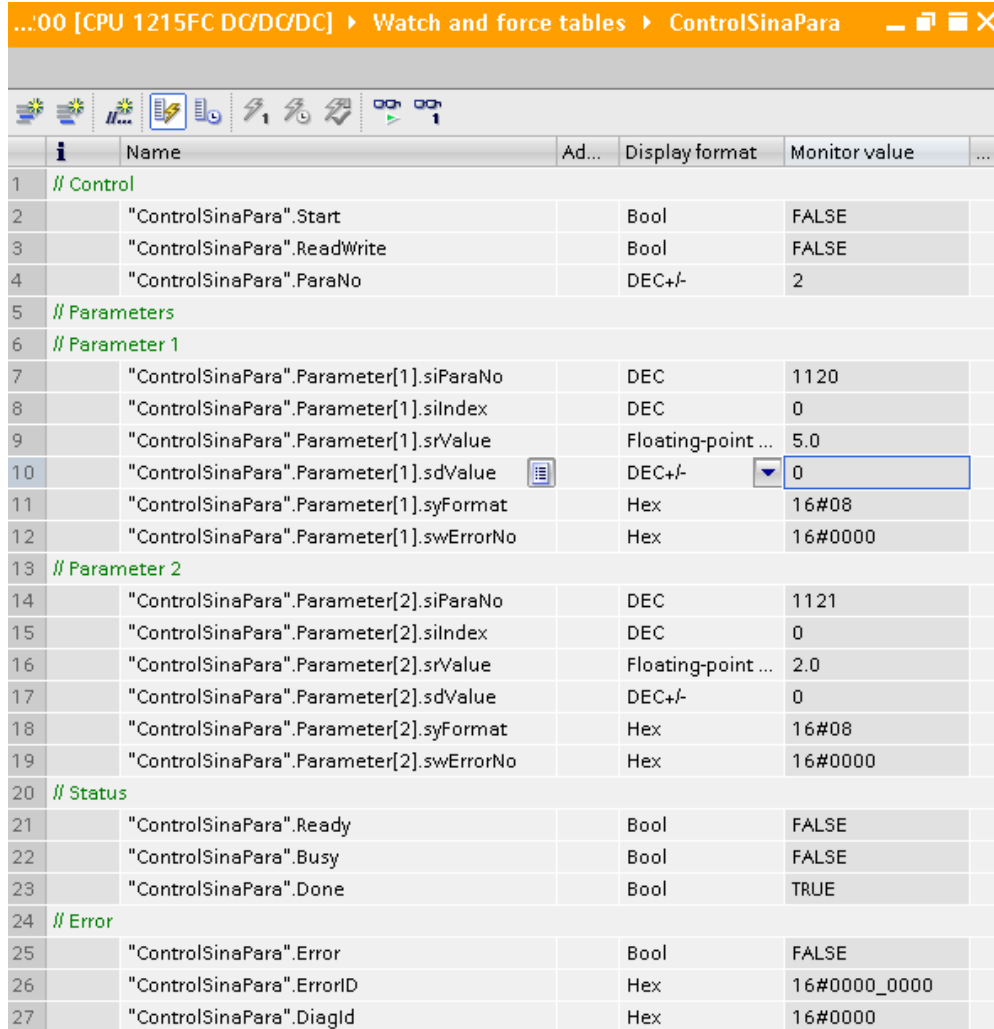
... 1215FC DC/DC/DC] ▶ Watch and force tables ▶ ControlSinaSpeedSafety						
	Name	Address	Display format	Monitor value	M...	
1	// Control					
2	"ControlSinaSpeed".EnableAxis		Bool		T...	
3	"ControlSinaSpeed".SpeedSp		DEC+/-		1...	
4	// Status					
5	"ControlSinaSpeed".AxisEnabled		Bool			
6	"ControlSinaSpeed".ActVelocity		Floating-point nu...			
7	"ControlSinaSpeed".Lockout		Bool			
8	"ControlSinaSpeed".Status		Hex			
9	// Error					
10	"ControlSinaSpeed".Error		Bool			
11	"ControlSinaSpeed".DiagId		Hex			
12	"ControlSinaSpeed".AckError		Bool		F...	
13	// Safety					
14	"ControlSafety".TriggerSTO		Bool		T...	
15	"ControlSafety".STOStatus		Bool			
16	// ACK_GL					
17	"ControlSafety".AckSafety		Bool			

Only projects
with Safety

ControlSinaPara tag table

The ControlSinaPara tag table contains all the tags needed to read two parameters from the drive or write them to the drive using the "SinaPara" instruction.

Figure 5-3 "ControlSinaPara" tag table



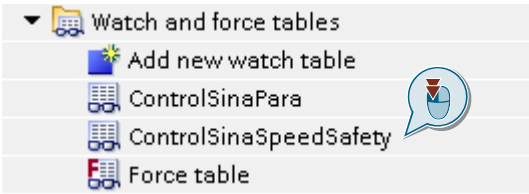
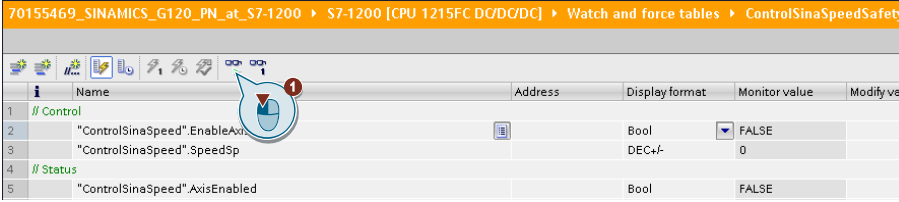
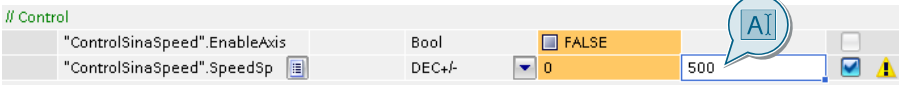
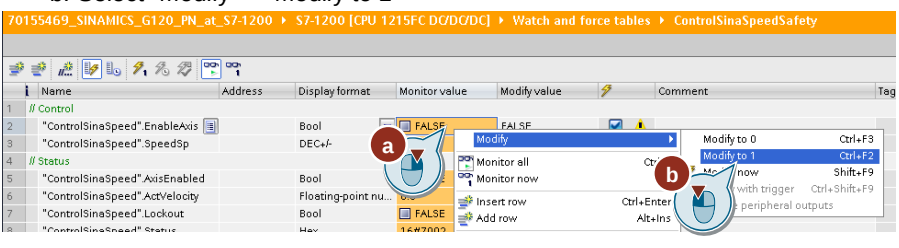
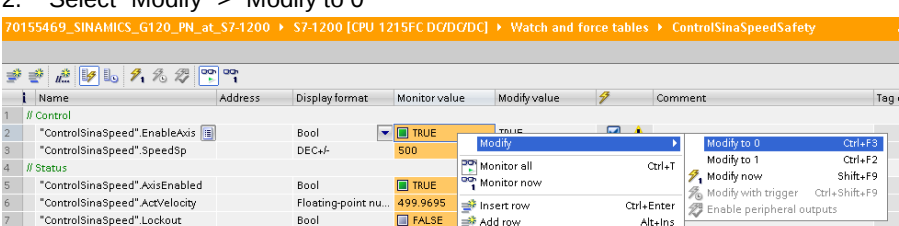
The screenshot shows the 'Watch and force tables' window for the 'ControlSinaPara' tag. The table lists various parameters and their current values. The 'Display format' column shows the data type and format, and the 'Monitor value' column shows the current value. A dropdown menu is open for the 'sdValue' of 'Parameter[1]', showing the value '0'.

	Name	Ad...	Display format	Monitor value
1	// Control			
2	"ControlSinaPara".Start		Bool	FALSE
3	"ControlSinaPara".ReadWrite		Bool	FALSE
4	"ControlSinaPara".ParaNo		DEC+/-	2
5	// Parameters			
6	// Parameter 1			
7	"ControlSinaPara".Parameter[1].siParaNo		DEC	1120
8	"ControlSinaPara".Parameter[1].siIndex		DEC	0
9	"ControlSinaPara".Parameter[1].srValue		Floating-point ...	5.0
10	"ControlSinaPara".Parameter[1].sdValue		DEC+/-	0
11	"ControlSinaPara".Parameter[1].syFormat		Hex	16#08
12	"ControlSinaPara".Parameter[1].swErrorNo		Hex	16#0000
13	// Parameter 2			
14	"ControlSinaPara".Parameter[2].siParaNo		DEC	1121
15	"ControlSinaPara".Parameter[2].siIndex		DEC	0
16	"ControlSinaPara".Parameter[2].srValue		Floating-point ...	2.0
17	"ControlSinaPara".Parameter[2].sdValue		DEC+/-	0
18	"ControlSinaPara".Parameter[2].syFormat		Hex	16#08
19	"ControlSinaPara".Parameter[2].swErrorNo		Hex	16#0000
20	// Status			
21	"ControlSinaPara".Ready		Bool	FALSE
22	"ControlSinaPara".Busy		Bool	FALSE
23	"ControlSinaPara".Done		Bool	TRUE
24	// Error			
25	"ControlSinaPara".Error		Bool	FALSE
26	"ControlSinaPara".ErrorID		Hex	16#0000_0000
27	"ControlSinaPara".DiagId		Hex	16#0000

5.2.2 Moving the drive

The following table shows how to use the "SinaSpeed" instruction via the "ControlSinaSpeed" tag table in the project to move the SINAMICS G120.

Table 5-2 Moving the drive via the tag table

No.	Action	Note
1.	Open the tag table "ControlSinaSpeed" or "ControlSinaSpeedSafety": 	
2.	Select "Monitor all" to view the online values in the watch table: 	If there is no online connection to the SIMATIC S7-1200 yet, it will be established automatically after selecting "Monitor all".
3.	Enter the desired speed setpoint in the "Modify value" column of the tag "ControlSinaSpeed.SpeedSp": 	
4.	Accept the entered value by clicking on "Modify all selected values once and now": 	
5.	Set the tag "ControlSinaSpeed.EnableAxis" to start the motion: a. Right-click on the tag's table row b. Select "Modify" > "Modify to 1" 	Once the "ControlSinaSpeed.EnableAxis" tag is set, the axis moves at the specified speed setpoint. Status values, such as the actual speed of the drive, are displayed in the "Status" section of the tag table.
6.	Reset the tag "ControlSinaSpeed.EnableAxis" to stop the motion: 1. Right-click on the tag's table row 2. Select "Modify" > "Modify to 0" 	

Troubleshooting

If an error occurs while the "SinaSpeed" block is processing, this will be indicated by the tag "ControlSinaSpeed.Error" in the "Error" section of the tag table. More information about pending errors is provided by the tags "ControlSinaSpeed.Status" and "ControlSinaSpeed.DiagId".

Note

Information about the values output by the tags "ControlSinaSpeed.Status" and "ControlSinaSpeed.DiagId" can be found in the TIA Portal Online Help material on the "SinaSpeed" instruction.

To acknowledge an error, set the tag "ControlSinaSpeed.EnableAxis" to "False" and set the tag "ControlSinaSpeed.AckError". Then reset the tag "ControlSinaSpeed.AckError".

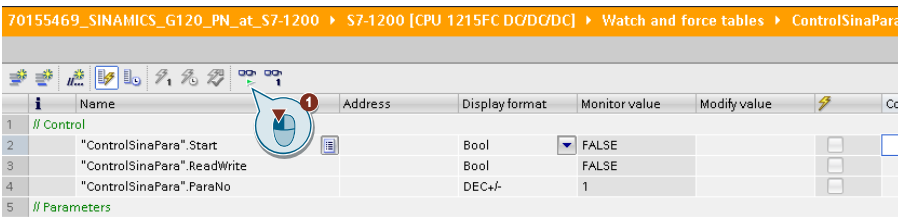
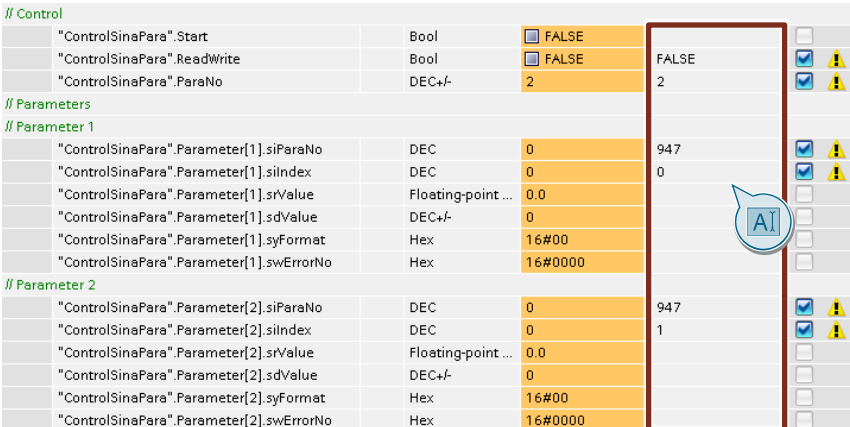
Figure 5-4 SinaSpeed status and error tags

// Status				
	"ControlSinaSpeed".AxisEnabled		Bool	☐ FALSE
	"ControlSinaSpeed".ActVelocity		Floating-point nu...	0.0
	"ControlSinaSpeed".Lockout		Bool	☐ FALSE
	"ControlSinaSpeed".Status		Hex	16#7002
// Error				
	"ControlSinaSpeed".Error		Bool	☐ FALSE
	"ControlSinaSpeed".DiagId		Hex	16#0000
	"ControlSinaSpeed".AckError		Bool	☐ FALSE

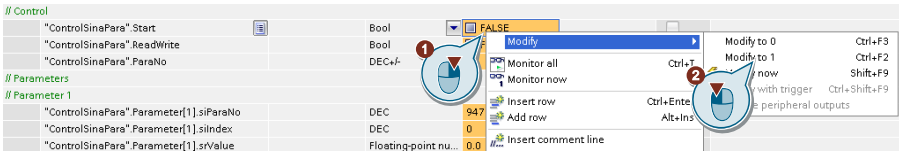
5.2.3 Reading error numbers from the SINAMICS G120

The following table shows how to acyclically read parameters from the drive using the "SinaPara" instruction. This can read, for example, error codes from the drive.

Table 5-3 Reading error numbers from the drive with a tag table

No.	Action	Note
1.	Open the tag table "ControlSinaPara": 	
2.	Select "Monitor all" to view the online values in the watch table: 	If there is no online connection to the SIMATIC S7-1200 yet, it will be established automatically after selecting "Monitor all".
3.	Configure the parameters to be read: a. Enter "FALSE" (read parameters) in the "Modify value" column of the tag "ControlSinaPara.ReadWrite". b. Enter "2" as the number of parameters to be read in the row of the tag "ControlSinaPara.ParaNo". c. Enter "947" (Fault number) for the parameters to be read in the row of the tags "ControlSinaPara.Parameter[1].siParaNo" and "ControlSinaPara.Parameter[2].siParaNo". d. Enter the indices "0" and "1" of the parameters/error numbers to be read in the rows of the tags "ControlSinaPara.Parameter[1].siIndex" and "ControlSinaPara.Parameter[2].siIndex". 	As an example, two parameters are read in the tag table. The SinaPara instruction can be used to read up to 16 parameters via the array "ControlSinaPara.Parameter[1-16]" Parameter 947 contains error numbers of the errors that are pending in the SINAMICS; it also serves as an error buffer for errors that are no longer active. More information about parameter "947" can be found in the TIA Portal Online Help.
4.	Accept the values entered by clicking on "Modify all selected values once and now": 	

5 How the project works

No.	Action	Note
5.	Set the tag "ControlSinaPara.Start": - Right-click on the tag's table row - Select "Modify" > "Modify to 1" 	The tag is automatically reset when the reading of parameters is complete. This can happen so quickly that the tag table does not show that the tag had a value of "TRUE".
6.	The error numbers that were read are output via the tag "ControlSinaPara.Parameter[x].srValue": <pre>// Parameter 1 "ControlSinaPara".Parameter[1].siParaNo DEC 947 "ControlSinaPara".Parameter[1].siIndex DEC 0 "ControlSinaPara".Parameter[1].srValue Floating-point nu... 7900.0 "ControlSinaPara".Parameter[1].sdValue DEC+/- 0 "ControlSinaPara".Parameter[1].syFormat Hex 16#06 "ControlSinaPara".Parameter[1].swErrorNo Hex 16#0000 // Parameter 2 "ControlSinaPara".Parameter[2].siParaNo DEC 947 "ControlSinaPara".Parameter[2].siIndex DEC 1 "ControlSinaPara".Parameter[2].srValue Floating-point nu... 0.0 "ControlSinaPara".Parameter[2].sdValue DEC+/- 0 "ControlSinaPara".Parameter[2].syFormat Hex 16#06 "ControlSinaPara".Parameter[2].swErrorNo Hex 16#0000</pre> Since only one error is active on the SINAMICS G120, only one error number is output. If no other error is active, the following tags return a value of "0.0".	An .xml file with texts/descriptions for the error numbers is provided with the SINAMICS firmware (16) and can be converted into a format that can be used for STEP 7 and HMI projects using the XML Parser for SINAMICS Warning and Error Messages (17). Parameters that have the data type "DINT" or "DWORD" are output by the tag "ControlSinaPara.Parameter[x].sdValue".

Troubleshooting

If an error occurs while the "SinaPara" block is processing, this will be indicated by the tag "ControlSinaPara.Error" in the "Error" section of the tag table. More information about pending errors is provided by the tags "ControlSinaSpeed.ErrorID" and "ControlSinaSpeed.DiagID".

Note

Information about the values output by the tags "ControlSinaPara.ErrorID" and "ControlSinaPara.DiagID" can be found in the TIA Portal Online Help concerning the "SinaPara" instruction.

In addition, whenever an error occurs, an error number is output via the "ControlSinaPara.Parameter[x].swErrorNo" tag for every parameter that must be read.

Note

For information about the values output by the tag "ControlSinaPara.Parameter[x].swErrorNo", see the TIA Portal Online Help for the instruction "SinaPara".

To acknowledge an error, set the tag "ControlSinaPara.Start" to "False" and then reset it if necessary if a new read operation must be started.

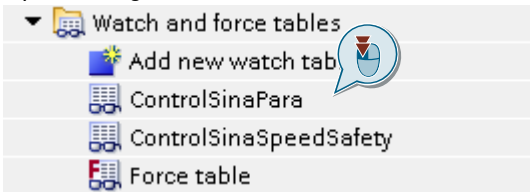
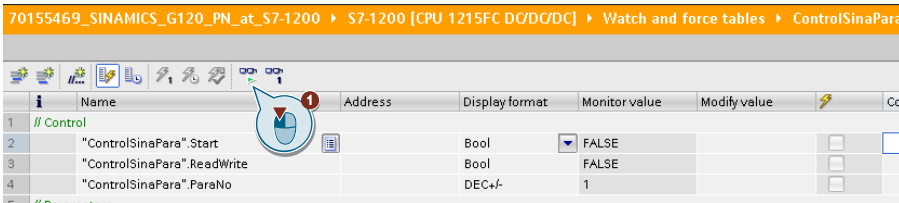
Figure 5-5 SinaPara status and error tags

// Parameter 1			
"ControlSinaPara".Parameter[1].siParaNo	DEC		1120
"ControlSinaPara".Parameter[1].siIndex	DEC		0
"ControlSinaPara".Parameter[1].srValue	Floating-point ...		5.0
"ControlSinaPara".Parameter[1].sdValue	DEC+/-		0
"ControlSinaPara".Parameter[1].svFormat	Hex		16#08
"ControlSinaPara".Parameter[1].swErrorNo	Hex		16#0000
// Parameter 2			
"ControlSinaPara".Parameter[2].siParaNo	DEC		1121
"ControlSinaPara".Parameter[2].siIndex	DEC		0
"ControlSinaPara".Parameter[2].srValue	Floating-point ...		2.0
"ControlSinaPara".Parameter[2].sdValue	DEC+/-		0
"ControlSinaPara".Parameter[2].svFormat	Hex		16#08
"ControlSinaPara".Parameter[2].swErrorNo	Hex		16#0000
// Status			
"ControlSinaPara".Ready	Bool		☐ FALSE
"ControlSinaPara".Busy	Bool		☐ FALSE
"ControlSinaPara".Done	Bool		☒ TRUE
// Error			
"ControlSinaPara".Error	Bool		☐ FALSE
"ControlSinaPara".ErrorID	Hex		16#0000_0000
"ControlSinaPara".DiagID	Hex		16#0000

5.2.4 Changing the ramp-up time and ramp-down time of the SINAMICS G120

The following table shows how to acyclically write parameters to the drive using the "SinaPara" instruction. As an example, the ramp-up and ramp-down times will be changed.

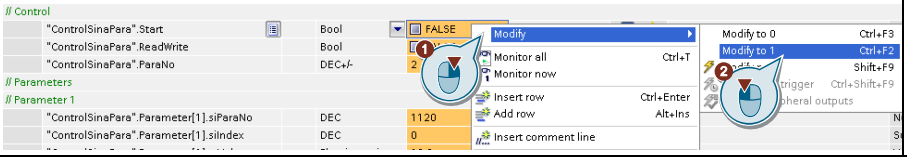
Table 5-4 Changing the ramp-up and ramp-down times via the tag table

No.	Action	Note
1.	Open the tag table "ControlSinaPara": 	
2.	Select "Monitor all" to view the online values in the watch table: 	If there is no online connection to the SIMATIC S7-1200 yet, it will be established automatically after selecting "Monitor all".

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No.	Action	Note																																																																											
3.	Optional: Read the current ramp-up and ramp-down time from the drive: To do this, follow the steps described in chapter 5.2.3 and read the parameters "1120" (ramp-up time) and "1121" (ramp-down time) instead of the parameter "947" with the indices "0" and "1": // Parameter 1 <table><tr><td>"ControlSinaPara".Parameter[1].siParaNo</td><td>DEC</td><td>1120</td><td>1120</td></tr><tr><td>"ControlSinaPara".Parameter[1].siIndex</td><td>DEC</td><td>0</td><td>0</td></tr><tr><td>"ControlSinaPara".Parameter[1].srValue</td><td>Floating-point ...</td><td>10.0</td><td></td></tr><tr><td>"ControlSinaPara".Parameter[1].sdValue</td><td>DEC+/-</td><td>0</td><td></td></tr><tr><td>"ControlSinaPara".Parameter[1].syFormat</td><td>Hex</td><td>16#08</td><td></td></tr><tr><td>"ControlSinaPara".Parameter[1].swErrorNo</td><td>Hex</td><td>16#0000</td><td></td></tr></table> // Parameter 2 <table><tr><td>"ControlSinaPara".Parameter[2].siParaNo</td><td>DEC</td><td>1121</td><td>1121</td></tr><tr><td>"ControlSinaPara".Parameter[2].siIndex</td><td>DEC</td><td>0</td><td>0</td></tr><tr><td>"ControlSinaPara".Parameter[2].srValue</td><td>Floating-po...</td><td>10.0</td><td></td></tr><tr><td>"ControlSinaPara".Parameter[2].sdValue</td><td>DEC+/-</td><td>0</td><td></td></tr><tr><td>"ControlSinaPara".Parameter[2].syFormat</td><td>Hex</td><td>16#08</td><td></td></tr><tr><td>"ControlSinaPara".Parameter[2].swErrorNo</td><td>Hex</td><td>16#0000</td><td></td></tr></table>	"ControlSinaPara".Parameter[1].siParaNo	DEC	1120	1120	"ControlSinaPara".Parameter[1].siIndex	DEC	0	0	"ControlSinaPara".Parameter[1].srValue	Floating-point ...	10.0		"ControlSinaPara".Parameter[1].sdValue	DEC+/-	0		"ControlSinaPara".Parameter[1].syFormat	Hex	16#08		"ControlSinaPara".Parameter[1].swErrorNo	Hex	16#0000		"ControlSinaPara".Parameter[2].siParaNo	DEC	1121	1121	"ControlSinaPara".Parameter[2].siIndex	DEC	0	0	"ControlSinaPara".Parameter[2].srValue	Floating-po...	10.0		"ControlSinaPara".Parameter[2].sdValue	DEC+/-	0		"ControlSinaPara".Parameter[2].syFormat	Hex	16#08		"ControlSinaPara".Parameter[2].swErrorNo	Hex	16#0000		The ramp-up time and ramp-down time set in the project (and parameterized after downloading the converter) are each 10 s.																											
"ControlSinaPara".Parameter[1].siParaNo	DEC	1120	1120																																																																										
"ControlSinaPara".Parameter[1].siIndex	DEC	0	0																																																																										
"ControlSinaPara".Parameter[1].srValue	Floating-point ...	10.0																																																																											
"ControlSinaPara".Parameter[1].sdValue	DEC+/-	0																																																																											
"ControlSinaPara".Parameter[1].syFormat	Hex	16#08																																																																											
"ControlSinaPara".Parameter[1].swErrorNo	Hex	16#0000																																																																											
"ControlSinaPara".Parameter[2].siParaNo	DEC	1121	1121																																																																										
"ControlSinaPara".Parameter[2].siIndex	DEC	0	0																																																																										
"ControlSinaPara".Parameter[2].srValue	Floating-po...	10.0																																																																											
"ControlSinaPara".Parameter[2].sdValue	DEC+/-	0																																																																											
"ControlSinaPara".Parameter[2].syFormat	Hex	16#08																																																																											
"ControlSinaPara".Parameter[2].swErrorNo	Hex	16#0000																																																																											
4.	Configure the parameters to be written: a. Enter "TRUE" (read parameters) in the "Modify value" column of the tag "ControlSinaPara.ReadWrite". b. Enter "2" as the number of parameters to be read in the row of the tag "ControlSinaPara.ParaNo". c. Enter "1120" (ramp-up time) and "1121" (ramp-down time) for the parameters you want to write in the rows of the tags "ControlSinaPara.Parameter[1].siParaNo" and "ControlSinaPara.Parameter[2].siParaNo". d. Enter the index "0" in the rows of the tags "ControlSinaPara.Parameter[1].siIndex" und "ControlSinaPara.Parameter[2].siIndex". e. Enter "5" (5 seconds) as the value for the ramp-up time and "2" (2 seconds) as the value for the ramp-down time in the rows of the tags "ControlSinaPara.Parameter[1].srValue" und "ControlSinaPara.Parameter[2].srValue". // Control <table><tr><td>"ControlSinaPara".Start</td><td>Bool</td><td>☐ FALSE</td><td></td><td>☐</td></tr><tr><td>"ControlSinaPara".ReadWrite</td><td>Bool</td><td>☐ FALSE</td><td>TRUE</td><td>☒</td></tr><tr><td>"ControlSinaPara".ParaNo</td><td>DEC+/-</td><td>2</td><td>2</td><td>☒</td></tr></table> // Parameters // Parameter 1 <table><tr><td>"ControlSinaPara".Parameter[1].siParaNo</td><td>DEC</td><td>1120</td><td>1120</td><td>☒</td></tr><tr><td>"ControlSinaPara".Parameter[1].siIndex</td><td>DEC</td><td>0</td><td>0</td><td>☒</td></tr><tr><td>"ControlSinaPara".Parameter[1].srValue</td><td>Floating-point ...</td><td>10.0</td><td>5.0</td><td>☒</td></tr><tr><td>"ControlSinaPara".Parameter[1].sdValue</td><td>DEC+/-</td><td>0</td><td></td><td>☐</td></tr><tr><td>"ControlSinaPara".Parameter[1].syFormat</td><td>Hex</td><td>16#08</td><td></td><td>☐</td></tr><tr><td>"ControlSinaPara".Parameter[1].swErrorNo</td><td>Hex</td><td>16#0000</td><td></td><td>☐</td></tr></table> // Parameter 2 <table><tr><td>"ControlSinaPara".Parameter[2].siParaNo</td><td>DEC</td><td>1121</td><td>1121</td><td>☒</td></tr><tr><td>"ControlSinaPara".Parameter[2].siIndex</td><td>DEC</td><td>0</td><td>0</td><td>☒</td></tr><tr><td>"ControlSinaPara".Parameter[2].srValue</td><td>Floating-po...</td><td>10.0</td><td>2.0</td><td>☒</td></tr><tr><td>"ControlSinaPara".Parameter[2].sdValue</td><td>DEC+/-</td><td>0</td><td></td><td>☐</td></tr><tr><td>"ControlSinaPara".Parameter[2].syFormat</td><td>Hex</td><td>16#08</td><td></td><td>☐</td></tr><tr><td>"ControlSinaPara".Parameter[2].swErrorNo</td><td>Hex</td><td>16#0000</td><td></td><td>☐</td></tr></table>	"ControlSinaPara".Start	Bool	☐ FALSE		☐	"ControlSinaPara".ReadWrite	Bool	☐ FALSE	TRUE	☒	"ControlSinaPara".ParaNo	DEC+/-	2	2	☒	"ControlSinaPara".Parameter[1].siParaNo	DEC	1120	1120	☒	"ControlSinaPara".Parameter[1].siIndex	DEC	0	0	☒	"ControlSinaPara".Parameter[1].srValue	Floating-point ...	10.0	5.0	☒	"ControlSinaPara".Parameter[1].sdValue	DEC+/-	0		☐	"ControlSinaPara".Parameter[1].syFormat	Hex	16#08		☐	"ControlSinaPara".Parameter[1].swErrorNo	Hex	16#0000		☐	"ControlSinaPara".Parameter[2].siParaNo	DEC	1121	1121	☒	"ControlSinaPara".Parameter[2].siIndex	DEC	0	0	☒	"ControlSinaPara".Parameter[2].srValue	Floating-po...	10.0	2.0	☒	"ControlSinaPara".Parameter[2].sdValue	DEC+/-	0		☐	"ControlSinaPara".Parameter[2].syFormat	Hex	16#08		☐	"ControlSinaPara".Parameter[2].swErrorNo	Hex	16#0000		☐	The values of 2 s and 5 s are chosen as examples and can be replaced by values that are required for your application.
"ControlSinaPara".Start	Bool	☐ FALSE		☐																																																																									
"ControlSinaPara".ReadWrite	Bool	☐ FALSE	TRUE	☒																																																																									
"ControlSinaPara".ParaNo	DEC+/-	2	2	☒																																																																									
"ControlSinaPara".Parameter[1].siParaNo	DEC	1120	1120	☒																																																																									
"ControlSinaPara".Parameter[1].siIndex	DEC	0	0	☒																																																																									
"ControlSinaPara".Parameter[1].srValue	Floating-point ...	10.0	5.0	☒																																																																									
"ControlSinaPara".Parameter[1].sdValue	DEC+/-	0		☐																																																																									
"ControlSinaPara".Parameter[1].syFormat	Hex	16#08		☐																																																																									
"ControlSinaPara".Parameter[1].swErrorNo	Hex	16#0000		☐																																																																									
"ControlSinaPara".Parameter[2].siParaNo	DEC	1121	1121	☒																																																																									
"ControlSinaPara".Parameter[2].siIndex	DEC	0	0	☒																																																																									
"ControlSinaPara".Parameter[2].srValue	Floating-po...	10.0	2.0	☒																																																																									
"ControlSinaPara".Parameter[2].sdValue	DEC+/-	0		☐																																																																									
"ControlSinaPara".Parameter[2].syFormat	Hex	16#08		☐																																																																									
"ControlSinaPara".Parameter[2].swErrorNo	Hex	16#0000		☐																																																																									
5.	Accept the values entered by clicking on "Modify all selected values once and now":																																																																												

5 How the project works

No.	Action	Note
6.	Set the tag "ControlSinaPara.Start" to write the parameters to the drive: - Right-click on the tag's table row - Select "Modify" > "Modify to 1" 	The tag is automatically reset when writing of the parameters is complete. This can happen so quickly that the tag table does not show that the tag had a value of "TRUE".
7.	Optional: Verify that the writing of the parameters was successful: - Set "ControlSinaPara".ReadWrite to "FALSE" - Set the tag "ControlSinaPara.Start" 	

Troubleshooting

If an error occurs while the "SinaPara" block is processing, this will be indicated by the tag "ControlSinaPara.Error" in the "Error" section of the tag table. More information about pending errors is provided by the tags "ControlSinaSpeed.ErrorID" and "ControlSinaSpeed.DiagID".

Note

Information about the values output by the tags "ControlSinaPara.ErrorID" and "ControlSinaPara. DiagID" can be found in the TIA Portal Online Help concerning the "SinaPara" instruction.

In addition, in the event of an error, an error number is output for each parameter that should be written, via the tag "ControlSinaPara.Parameter[x].swErrorNo".

Note

For information about the values output by the tag "ControlSinaPara.Parameter[x].swErrorNo", see the TIA Portal Online Help for the instruction "SinaPara".

To acknowledge an error, set the tag "ControlSinaSpeed.Start" to "False" and then reset it if necessary when you wish to start a new write operation.

Figure 5-6 SinaPara status and error tags

// Parameter 1			
"ControlSinaPara".Parameter[1].siParaNo	DEC	1120	
"ControlSinaPara".Parameter[1].siIndex	DEC	0	
"ControlSinaPara".Parameter[1].srValue	Floating-point ...	5.0	
"ControlSinaPara".Parameter[1].sdValue	DEC+/-	0	
"ControlSinaPara".Parameter[1].svFormat	Hex	16#08	
"ControlSinaPara".Parameter[1].swErrorNo	Hex	16#0000	
// Parameter 2			
"ControlSinaPara".Parameter[2].siParaNo	DEC	1121	
"ControlSinaPara".Parameter[2].siIndex	DEC	0	
"ControlSinaPara".Parameter[2].srValue	Floating-point ...	2.0	
"ControlSinaPara".Parameter[2].sdValue	DEC+/-	0	
"ControlSinaPara".Parameter[2].svFormat	Hex	16#08	
"ControlSinaPara".Parameter[2].swErrorNo	Hex	16#0000	
// Status			
"ControlSinaPara".Ready	Bool	☐ FALSE	
"ControlSinaPara".Busy	Bool	☐ FALSE	
"ControlSinaPara".Done	Bool	☒ TRUE	
// Error			
"ControlSinaPara".Error	Bool	☐ FALSE	
"ControlSinaPara".ErrorID	Hex	16#0000_0000	
"ControlSinaPara".DiagID	Hex	16#0000	

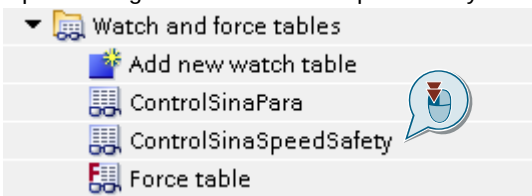
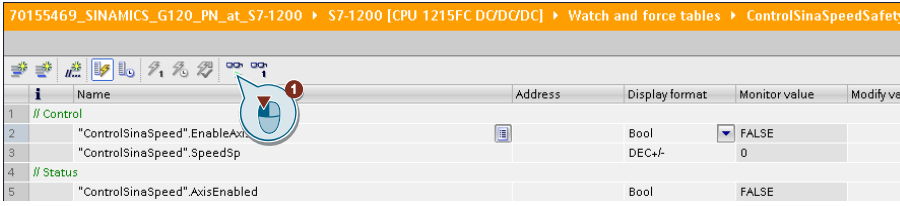
5.2.5 Triggering and resetting STO in the drive (only for projects with Safety)

The following table shows how you can use the tag table to trigger the Safety Integrated function "STO" in the drive and then reset it again.

ATTENTION

For a safety-related shutdown of the drive with the Safety Integrated functions, the entire shutdown path must be executed in a failsafe manner. This is not the case in the example project with tags in the standard program and via the HMI! In a real-world project, for example, the Safety Integrated function must be triggered via failsafe digital inputs.

Table 5-5 Triggering STO via tag table

No.	Action	Note
1.	Open the tag table "ControlSinaSpeedSafety": 	
2.	Select "Monitor all" to view the online values in the watch table: 	If there is no online connection to the SIMATIC S7-1200 yet, it will be established automatically after selecting "Monitor all".

5 How the project works

No.	Action	Note
3.	Reset the "ControlSafety.TriggerSTO" tag to trigger STO in the drive: a. Right-click on the tag's table row b. Select "Modify" > "Modify to 0"	Caution: For a safety-related shutdown of the drive with the Safety Integrated functions, the entire shutdown path must be executed in a failsafe manner. This is not the case in the example project with tags in the standard program and via the HMI! In a real-world project, for example, the Safety Integrated function must be triggered via failsafe digital inputs.
4.	Set the tag "ControlSafety.TriggerSTO" to trigger STO in the drive: a. Right-click on the tag's table row b. Select "Modify" > "Modify to 1"	The tag "ControlSafety.STOStatus" indicates that STO is active in the drive.

5.3 Operation with the HMI

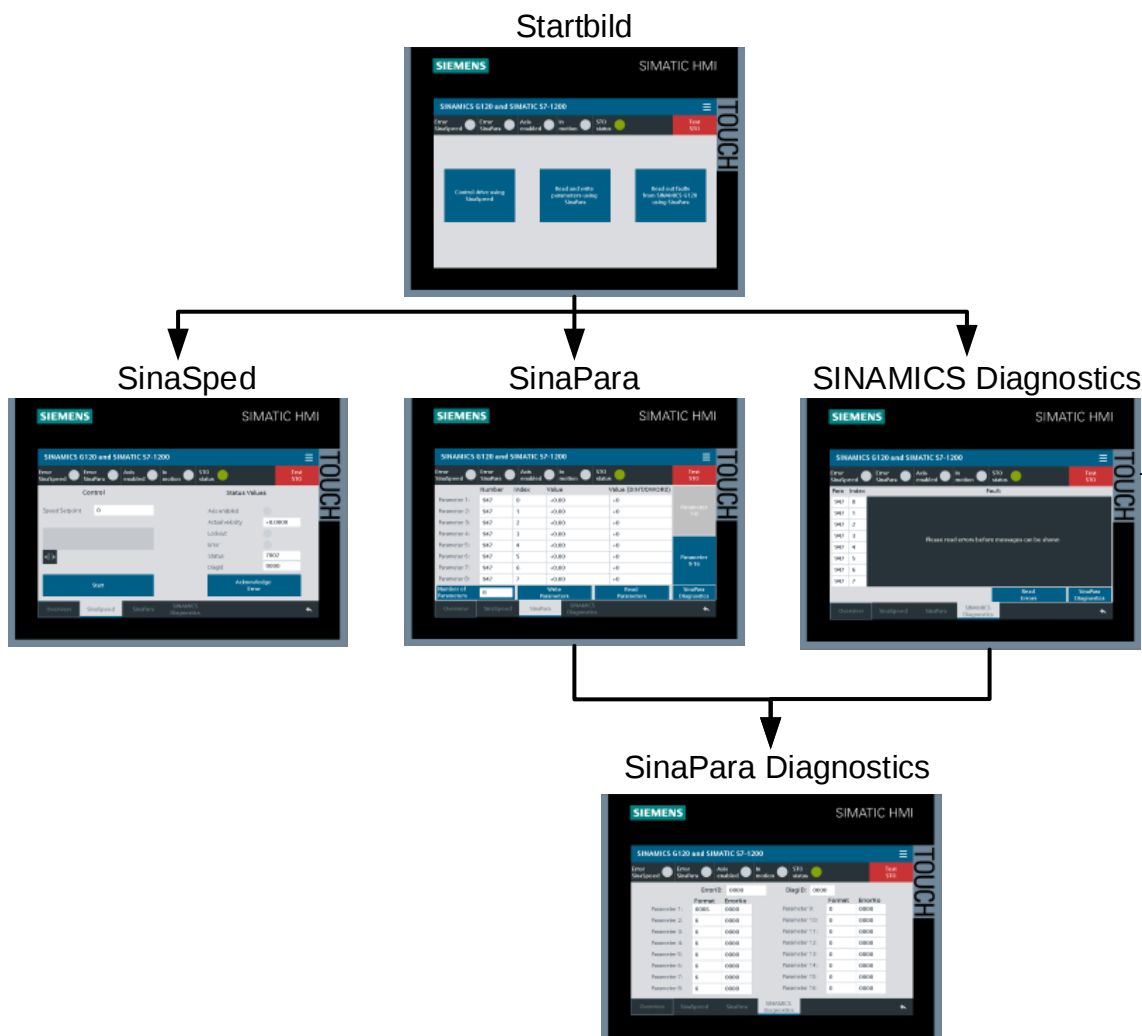
Instead of the tag table created in the project, you can also use the HMI. The HMI accesses the same tags in the controller as the tag table. The operation of the HMI is explained using five example scenarios:

- Moving the drive (SinaSpeed)
- Reading the ramp-up and ramp-down time from the SINAMICS G120 (SinaPara)
- Changing the ramp-up time and ramp-down time of the SINAMICS G120 (SinaPara)
- Reading error codes from the SINAMICS G120 (SinaPara)
- Triggering and resetting of STO in the drive (only with SIMATIC S7-1200F and Safety)

5.3.1 Structure of the HMI

The HMI project contains user interfaces to operate the application example. The structure of these interfaces is shown in the Figure below.

Figure 5-7 Overview of the HMI



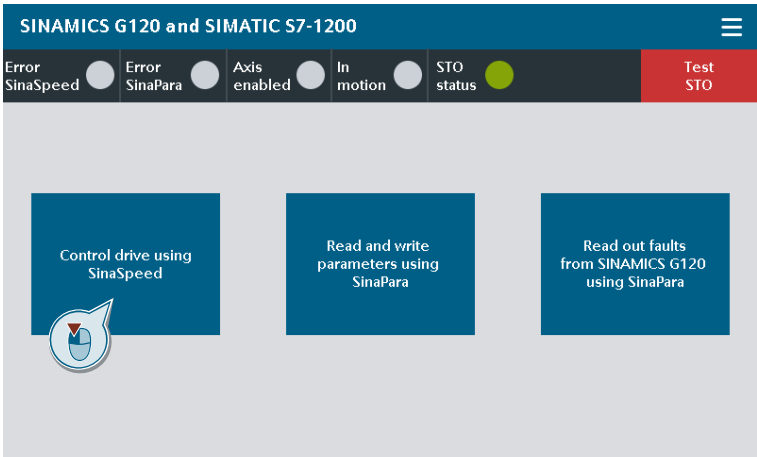
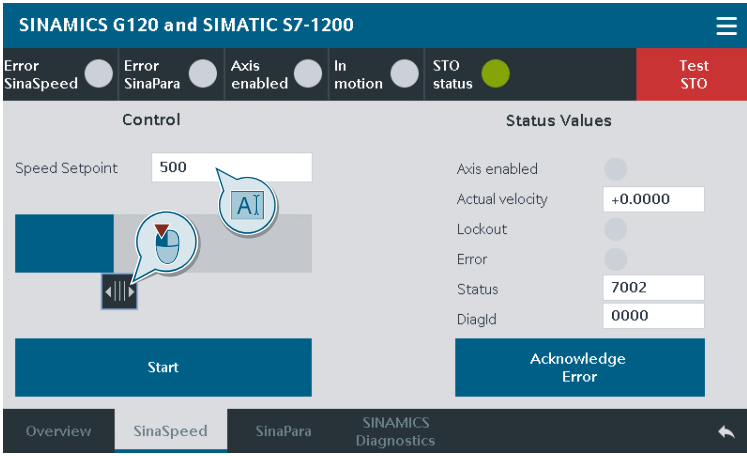
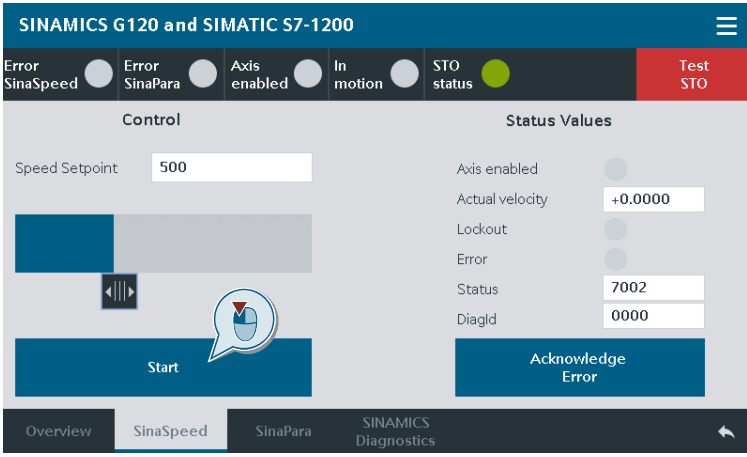
Note

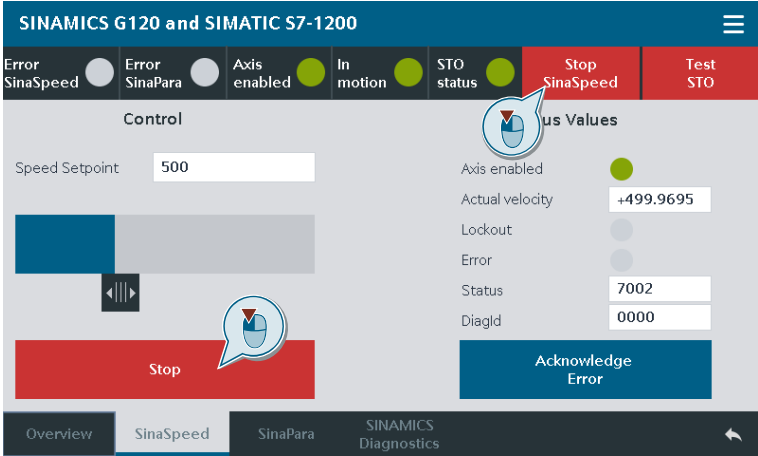
The HMI Template Suite (18) was used to create the HMI.

5.3.2 Moving the drive

The table below shows how to use the "SinaSpeed" instruction, in combination with the project's HMI and the "ControlSinaSpeed" tag table, to move the SINAMICS G120.

Table 5-6 Moving the drive via the HMI

No.	Action	Note
1.	On the home screen, tap the "Control drive using SinaSpeed" button: 	
2.	Enter the desired speed setpoint in the "Speed Setpoint" field. Alternatively, you can also set the set speed using the slider: 	
3.	Tap the "Start" button to start the motion: 	Status values of the "SinaSpeed" instruction are displayed on the right half of the screen and at the top of the status bar.

No.	Action	Note
4.	Tap the "Stop" or "Stop SinaSpeed" button to stop the motion: 	The "Stop SinaSpeed" button is displayed on all screens, so the motion can be stopped regardless of the active screen.

Troubleshooting

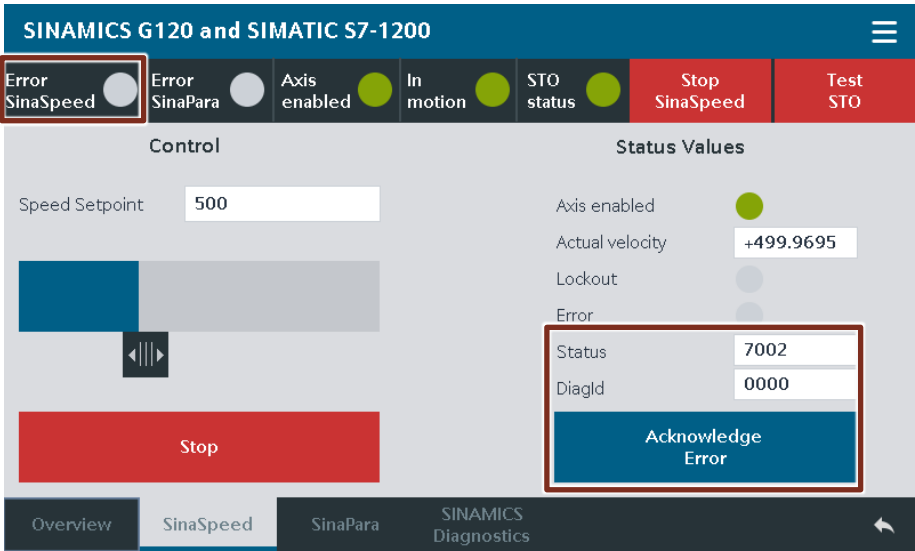
If an error occurs while the "SinaSpeed" block is processing, this will be indicated on the right side of the screen under "Error" and in the status bar in the "Error SinaSpeed" area. More information about pending errors is displayed on the right side of the screen via "Status" and the "DiagId".

Note

For information about the values of "Status" and "DiagId", see the TIA Portal Online Help on the "SinaSpeed" instruction.

To acknowledge an error, tap the "Stop" button if it is active, then tap "Acknowledge Error".

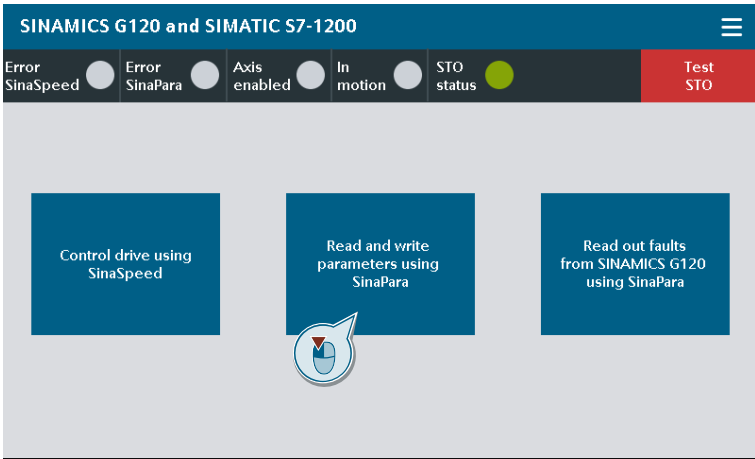
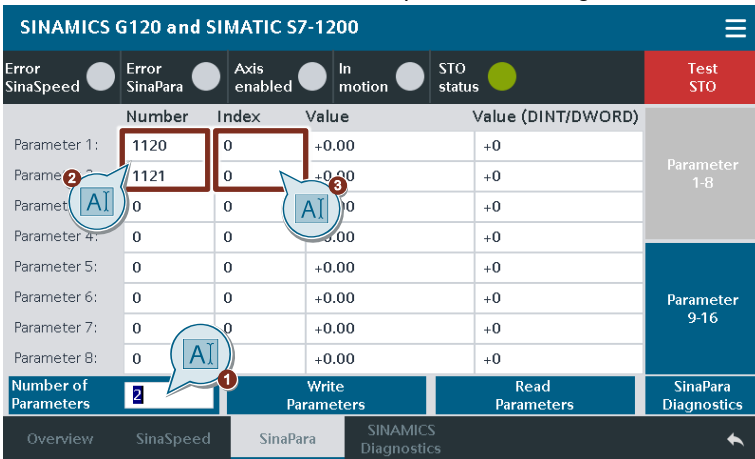
Figure 5-8 SinaSpeed error handling

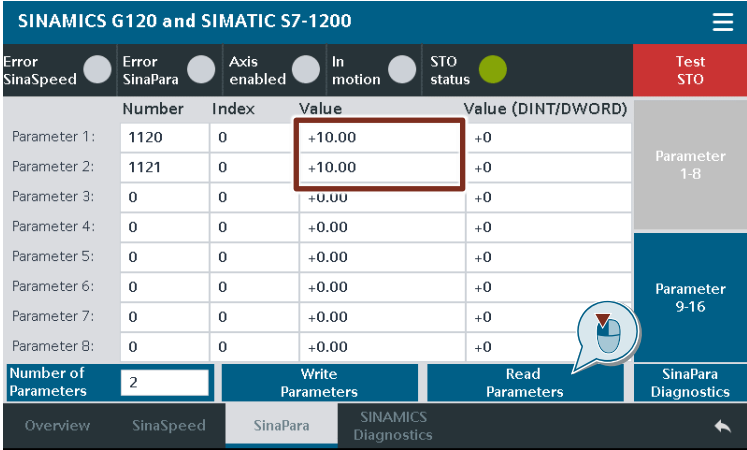


5.3.3 Reading the ramp-up time and ramp-down time from the SINAMICS G120

The following table shows how to acyclically read parameters from the drive using the "SinaPara" instruction. As an example, the ramp-up and ramp-down times will be read.

Table 5-7 Reading the ramp-up and ramp-down times via the HMI

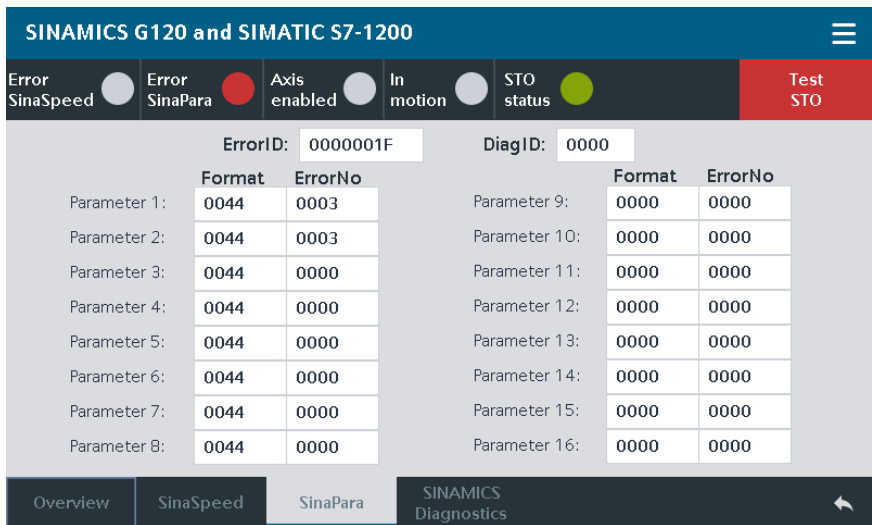
No.	Action	Note
1.	On the home screen, tap the "Read and write parameters using SinaPara" button: 	
2.	Configure the parameters to be read: - Enter "2" as the number of parameters to be read for "Number of Parameters" - Enter "1120" (ramp-up time) and "1121" (ramp-down time) as the parameter numbers you wish to read - Enter "0" as the index for both parameters being read 	The ramp-up and ramp-down time were chosen as example parameters for this scenario. This screen can also be used to read other parameters from the SINAMICS. There are always 8 parameters displayed in the table. On the right-hand side, you can choose whether you want to configure data for parameters 1-8 or parameters 9-16. This allows you to read or write up to 16 parameters simultaneously via the HMI.

No.	Action	Note
3.	Tap the "ReadParameters" button to read the parameters: 	The parameter values you just read are displayed in the "Value" column. Read values of parameters with the data types "DINT" or "DWORD" are displayed in the "Value (DINT / DWORD)" column. The ramp-up time and ramp-down time set in the project (and parameterized after downloading the converter) are each 10 s.

Troubleshooting

If an error occurs while the "SinaPara" block is processing, this will be indicated in the status bar with "Error SinaPara". More information about pending errors is displayed in the "SinaPara Diagnostics" screen, which you can open via the "SinaPara Diagnostics" button at the bottom right of the "SinaPara" screen.

Figure 5-9 SinaPara Diagnostics



SINAMICS G120 and SIMATIC S7-1200					
Error SinaSpeed	Error SinaPara	Axis enabled	In motion	STO status	Test STO
ErrorID: 0000001F DiagID: 0000					
Parameter 1:	Format: 0044	ErrorNo: 0003	Parameter 9:	Format: 0000	ErrorNo: 0000
Parameter 2:	Format: 0044	ErrorNo: 0003	Parameter 10:	Format: 0000	ErrorNo: 0000
Parameter 3:	Format: 0044	ErrorNo: 0000	Parameter 11:	Format: 0000	ErrorNo: 0000
Parameter 4:	Format: 0044	ErrorNo: 0000	Parameter 12:	Format: 0000	ErrorNo: 0000
Parameter 5:	Format: 0044	ErrorNo: 0000	Parameter 13:	Format: 0000	ErrorNo: 0000
Parameter 6:	Format: 0044	ErrorNo: 0000	Parameter 14:	Format: 0000	ErrorNo: 0000
Parameter 7:	Format: 0044	ErrorNo: 0000	Parameter 15:	Format: 0000	ErrorNo: 0000
Parameter 8:	Format: 0044	ErrorNo: 0000	Parameter 16:	Format: 0000	ErrorNo: 0000

The "SinaPara Diagnostics" screen displays the "ErrorID" and the "DiagID" of the "SinaPara" instruction on the HMI. In addition, the format of each parameter and an "ErrorNo" for each parameter are issued.

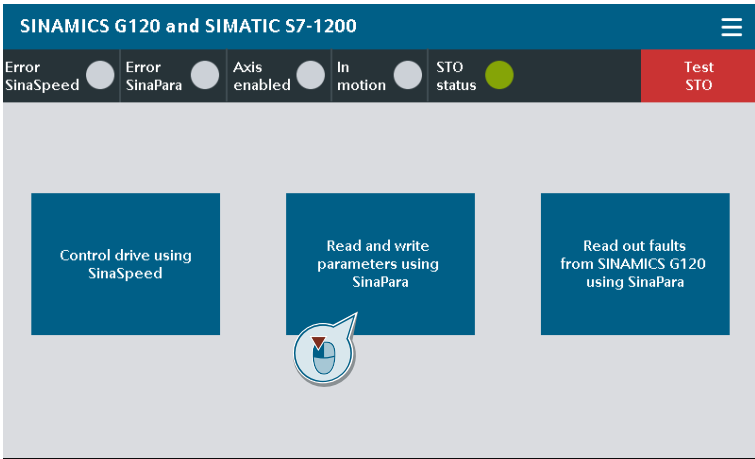
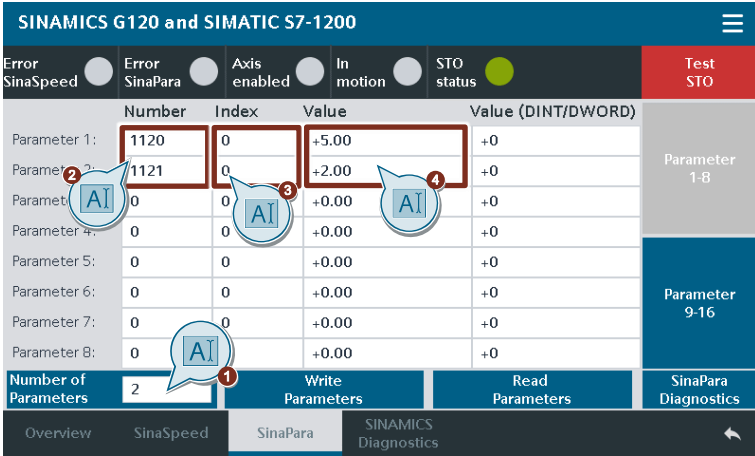
Note

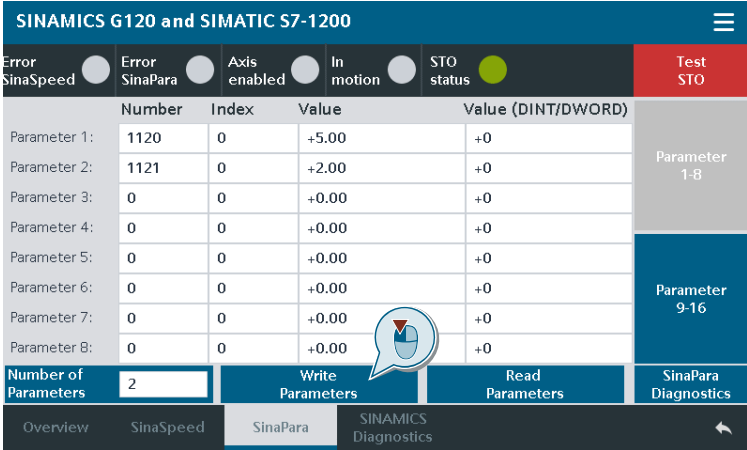
For information about the values output by the tag "SinaPara Diagnostics", see the TIA Portal Online Help for the instruction "SinaPara".

5.3.4 Changing the ramp-up time and ramp-down time of the SINAMICS G120

The following table shows how to acyclically write parameters to the drive using the "SinaPara" instruction. As an example, the ramp-up and ramp-down times will be changed.

Table 5-8 Changing the ramp-up time and ramp-down time via the HMI

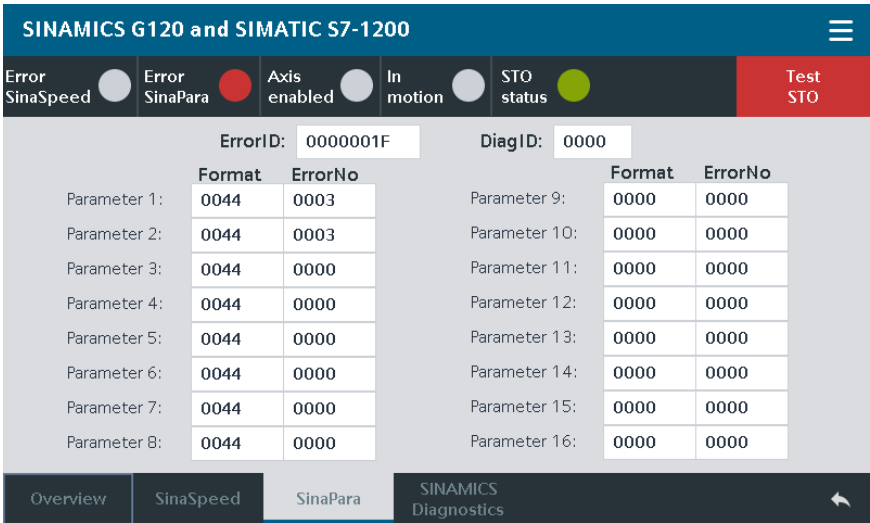
No.	Action	Note
1.	On the home screen, tap the "Read and write parameters using SinaPara" button: 	
2.	Configure the parameters to be written: - Enter "2" as the number of parameters to write for "Number of Parameters" - Enter "1120" (ramp-up time) and "1121" (ramp-down time) as the parameter numbers you wish to write - For both parameters, enter "0" as the index - Enter "5" (5 seconds) as the value for the ramp-up time and "2" (2 seconds) as the value for the ramp-down time in the parameters' "Value" column. 	The ramp-up and ramp-down time were chosen as example parameters for this scenario. This screen can also be used to write other parameters to the SINAMICS. The values of 2 s and 5 s are chosen as examples and can be replaced by values that are required for your application.

No.	Action	Note
3.	Tap the "WriteParameters" button to write the parameters: 	

Troubleshooting

If an error occurs while the "SinaPara" block is processing, this will be indicated in the status bar with "Error SinaPara". More information about pending errors is displayed in the "SinaPara Diagnostics" screen, which you can open via the "SinaPara Diagnostics" button at the bottom right of the "SinaPara" screen.

Figure 5-10 SinaPara Diagnostics



SINAMICS G120 and SIMATIC S7-1200					
Error SinaSpeed	Error SinaPara	Axis enabled	In motion	STO status	Test STO
ErrorID: 0000001F		DiagID: 0000			
	Format	ErrorNo		Format	ErrorNo
Parameter 1:	0044	0003	Parameter 9:	0000	0000
Parameter 2:	0044	0003	Parameter 10:	0000	0000
Parameter 3:	0044	0000	Parameter 11:	0000	0000
Parameter 4:	0044	0000	Parameter 12:	0000	0000
Parameter 5:	0044	0000	Parameter 13:	0000	0000
Parameter 6:	0044	0000	Parameter 14:	0000	0000
Parameter 7:	0044	0000	Parameter 15:	0000	0000
Parameter 8:	0044	0000	Parameter 16:	0000	0000

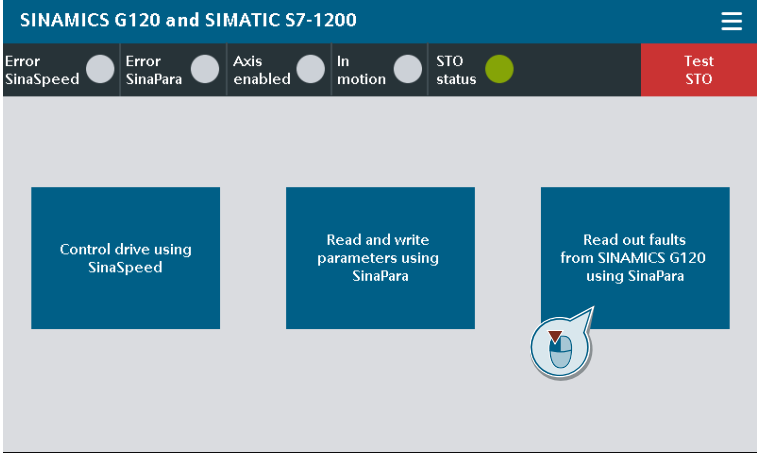
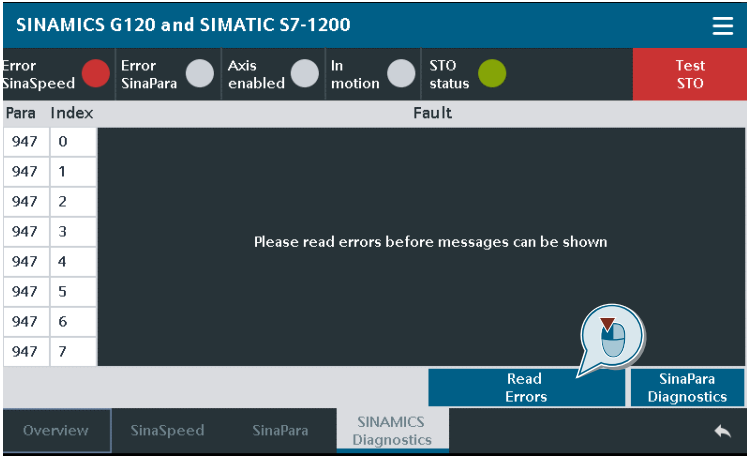
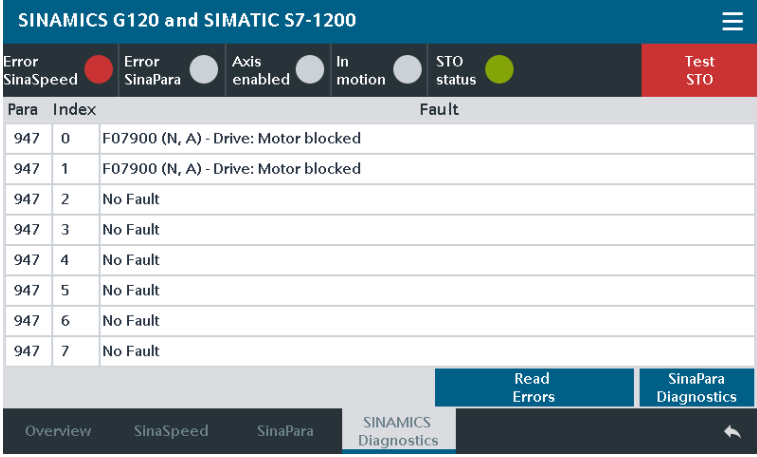
The "SinaPara Diagnostics" screen displays the "ErrorID" and the "DiagID" of the "SinaPara" instruction on the HMI. In addition, the format of each parameter and an "ErrorNo" for each parameter are issued.

Note For information about the values output by the tag "SinaPara Diagnostics", see the TIA Portal Online Help for the instruction "SinaPara".

5.3.5 Reading error messages from the drive

The following table shows how to acyclically read parameters from the drive using the "SinaPara" instruction. For example, error numbers will be read from the drive and displayed as a message on the HMI.

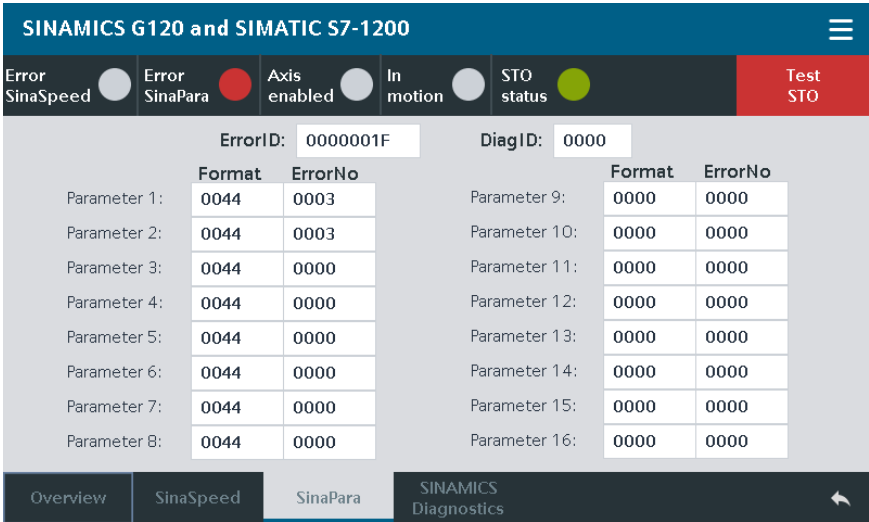
Table 5-9 Reading error messages via the HMI

No.	Action	Note
1.	On the home screen, tap the "Read out faults from SINAMICS G120 using SinaPara" button: 	
2.	Tap on "Read Errors" to read the error numbers from the drive and display them on the HMI: 	The parameters to be read are automatically pre-assigned with parameter "947" with the indices 0-8, and cannot be changed in this screen.
3.	The error numbers that you just read are displayed on the HMI with a message: 	An .xml file with texts/descriptions for the error numbers is provided with the SINAMICS firmware (16) and can be converted into a format that can be used for STEP 7 and HMI projects using the XML Parser for SINAMICS Warning and Error Messages (17) .

Troubleshooting

If an error occurs while the "SinaPara" block is processing, this will be indicated in the status bar with "Error SinaPara". More information about pending errors is displayed in the "SinaPara Diagnostics" screen, which you can open by clicking on the "SinaPara Diagnostics" button at the bottom right of the "SINAMICS Diagnostics" screen.

Figure 5-11 SinaPara Diagnostics



The "SinaPara Diagnostics" screen displays the "ErrorID" and the "DiagID" of the "SinaPara" instruction on the HMI. In addition, the format of each parameter and an "ErrorNo" for each parameter are issued.

Note

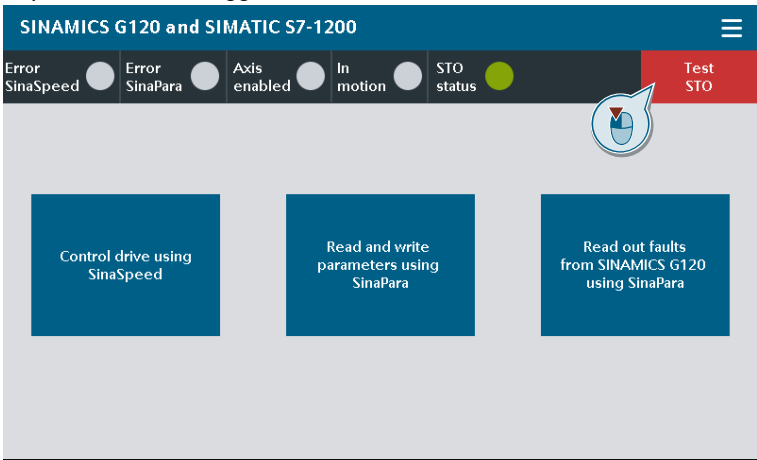
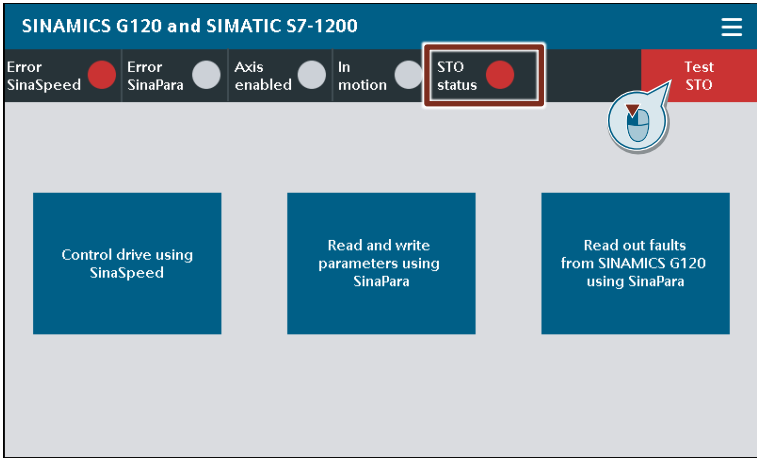
For information about the values output by the tag "SinaPara Diagnostics", see the TIA Portal Online Help for the instruction "SinaPara".

5.3.6 Triggering and resetting STO in the drive (only with SIMATIC S7-1200F)

The following table shows how to use the HMI to trigger the Safety Integrated function "STO" in the drive and then reset it again.

ATTENTION	For a safety-related shutdown of the drive with the Safety Integrated functions, the entire shutdown path must be executed in a failsafe manner. This is not the case in the example project with tags in the standard program and via the HMI! In a real-world project, for example, the Safety Integrated function must be triggered via failsafe digital inputs.
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Table 5-10 Triggering STO from the HMI

No.	Action	Note
1.	Tap "Test STO" to trigger STO in the drive: 	Caution: For a safety-related shutdown of the drive with the Safety Integrated functions, the entire shutdown path must be executed in a failsafe manner. This is not the case in the example project with tags in the standard program and via the HMI! In a real-world project, for example, the Safety Integrated function must be triggered via failsafe digital inputs.
2.	Tap "Test STO" to trigger STO in the drive: 	As long as STO is triggered in the drive, this will be indicated via "STO Status".

6 Appendix

6.1 Service and support

SiePortal

The integrated platform for product selection, purchasing and support - and connection of Industry Mall and Online support. The SiePortal home page replaces the previous home pages of the Industry Mall and the Online Support Portal (SIOS) and combines them.

- **Products & Services**
In Products & Services, you can find all our offerings as previously available in Mall Catalog.
- **Support**
In Support, you can find all information helpful for resolving technical issues with our products.
- **mySieportal**
mySiePortal collects all your personal data and processes, from your account to current orders, service requests and more. You can only see the full range of functions here after you have logged in.

You can access SiePortal via this address: sieportal.siemens.com

Technical Support

The Technical Support of Siemens Industry provides you fast and competent support regarding all technical queries with numerous tailor-made offers – ranging from basic support to individual support contracts.

Please send queries to Technical Support via Web form:
support.industry.siemens.com/cs/my/src

SITRAIN – Digital Industry Academy

We support you with our globally available training courses for industry with practical experience, innovative learning methods and a concept that's tailored to the customer's specific needs.

For more information on our offered trainings and courses, as well as their locations and dates, refer to our web page:

siemens.com/sitrain

Industry Online Support app

You will receive optimum support wherever you are with the "Industry Online Support" app. The app is available for iOS and Android:



6.2 Links and literature

Table 6-1

No.	Topic
\1\	Siemens Industry Online Support https://support.industry.siemens.com
\2\	Link to this entry page of this application example https://support.industry.siemens.com/cs/ww/en/view/70155469
\3\	SINAMICS G120 converters with CU240B-2 and CU240E-2 Control Units https://support.industry.siemens.com/cs/ww/en/view/109782865
\4\	Supplementary blocks for the DriveLib blocks enable switching of the "ConfigAxis" and "ConfigEPos" block inputs https://support.industry.siemens.com/cs/ww/en/view/109758413
\5\	SIMATIC - Failsafe library LDrvSafe to control the Safety Integrated functions of the SINAMICS drive family https://support.industry.siemens.com/cs/ww/en/view/109485794
\6\	SINAMICS Firmware version 4.7 SP13 HF7 for SINAMICS G120 https://support.industry.siemens.com/cs/ww/en/view/109781019
\7\	Transforming warning and error messages of a SINAMICS drive with the aid of the XML parser and integrating them into a STEP 7 / HMI project https://support.industry.siemens.com/cs/ww/en/view/77467239
\8\	HMI design with the HMI Template Suite https://support.industry.siemens.com/cs/ww/en/view/91174767

6.3 Change documentation

Table 6-2

Version	Date	Modifications
V1.0	07/2013	First edition
V1.2	07/2014	Update for TIA Portal V13
V1.3	11/2014	Updated for SINAMICS FW4.7
V2.0	10/2022	Migrated to SinaSpeed and SinaPara, Safety via PROFIsafe, HMI update, updates to TIA Portal V17
V2.1	05/2024	Updated for TIA Portal V19